UNIV. OF MICHIGAN
OCT 1 1952
ENGINEERING LIBRARY

SEPTEMBER 1952
No. 184

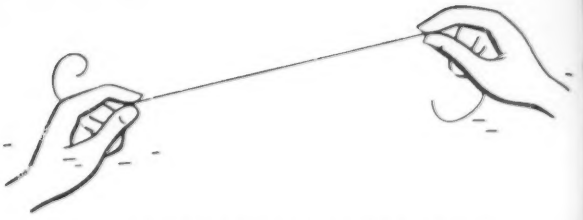
ASTM Bulletin

NEWS—Standardization Activities of Technical Committees; New Publications; Fall District Meetings; Conservation of Cobalt.

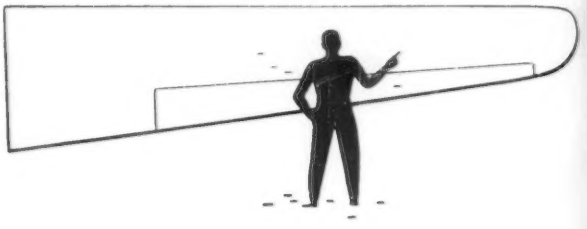
PAPERS—Aircraft Gear Lubricant Test; Density of Lightweight Concrete Aggregates; Stress Relaxation in Plastics; Settling Rate of Hydrated Lime Slurries; Fatigue Machines for Low Temperatures and Miniature Specimens; Problems in New Synthetic Fibers.

American Society for Testing Materials

FROM BANJO STRINGS



TO AIRPLANE WINGS



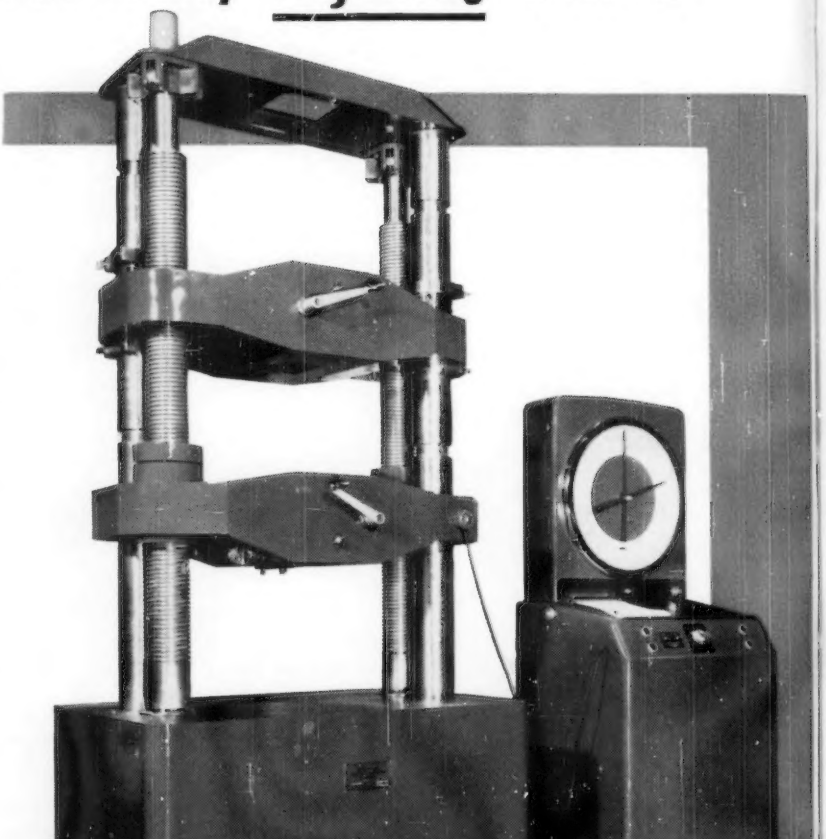
you can test practically anything with a

RIEHLE
UNIVERSAL TESTING MACHINE

Every Riehle Pendomatic Universal Testing Machine has 5 standard scale ranges, so that it is actually the equivalent of 5 testing machines in one. You can test small specimens with a relatively low-rupture-point (banjo strings, for example) or large high-yield-point specimens (like airplane wings) all on the same Riehle machine. No accessories are needed; all you do is turn the selector knob to the desired range. Guaranteed accuracy is within ½ of 1%.

Hydraulic and Screw Power Types

Riehle Universal Testing Machines are built both with hydraulic loading unit and with screw power loading unit. Each type is available in a variety of sizes, with capacities up through 400,000 lbs. Ask your Riehle representative or write our factory for illustrated catalogs.



400,000-lbs. capacity Riehle Hydraulic Universal Testing Machine illustrated.

RIEHLE TESTING MACHINES

Division of AMERICAN MACHINE AND METALS, INC.

East Moline, Illinois

"ONE TEST IS WORTH A THOUSAND EXPERT OPINIONS"

Reg. U. S. Pat. Off.

OFFICERS

BOARD OF DIRECTORS

President
H. L. MAXWELL

Vice-Presidents
L. C. BEARD, JR. N. L. MOCHEL

Directors

Term ending 1953
B. A. ANDERTON
R. H. BROWN
D. K. CRAMPTON
H. G. MILLER
J. R. TRIMBLE

Term ending 1954
J. W. BOLTON
R. A. SCHATZEL
E. O. SLATER
STANTON WALKER
F. P. ZIMMERLI

Term ending 1955
G. R. GOHN
W. H. LUTZ
H. K. NASON
A. O. SCHAEFER
M. A. SWAYZE

Past-Presidents
J. G. MORROW L. J. MARKWARDT
T. S. FULLER

EXECUTIVE SECRETARY

COMMITTEE ON PAPERS AND PUBLICATIONS

This committee has authority in all matters affecting the acceptance, rejection, editing and publication of papers, committee reports, and discussions. The committee also acts in an advisory capacity to the Board of Directors in publication matters in general.

R. C. ADAMS
T. J. DOLAN
L. E. GREGG
G. R. GOHN
L. A. MELSHEIMER
L. S. REID
C. H. SAMPLE
L. W. WOOD
L. L. WYMAN

Correspondent Members from Pacific Coast District

F. J. CONVERSE R. E. DAVIS

The Society is not responsible, as a body, for the statements and opinions advanced in this publication.

ASTM BULLETIN, September, 1952. Published eight times a year, January, February, April, May, July, September, October, and December, by the American Society for Testing Materials. Publication Office—20th and Northampton Sts., Easton, Pa. Editorial and advertising offices at the headquarters of the Society, 1916 Race St., Philadelphia 3, Pa. Subscriptions, United States and possessions, one year, $2.75; two years, $4.75; three years, $6.50; Canada, one year, $3.25; two years, $5.75; three years, $8.00. Other countries, one year, $3.75; two years, $6.75; three years, $9.50. Single Copies—50 cents. Number 184. Entered as second class matter April 8, 1940, at the post office at Easton, Pa., under the act of March 3, 1879.

Copyrighted, 1952, by the American Society for Testing Materials.

ASTM BULLETIN

Published by
AMERICAN SOCIETY for
TESTING MATERIALS
1916 Race St., Philadelphia 3, Pa.
1902—50th Anniversary—1952

This Issue Contains

Standardization Activities of Technical Committees.....5–15
Critical Cobalt Situation Discussed at ODM-ASTM Meeting.....28–30
A Test for Aircraft Gear Lubricants, *by E. A. Ryder*..... 41
Variation in Density of Lightweight Concrete Aggregates, *by Harold S. Sweet*.. 44
Stress Relaxation in Plastics and Insulating Materials, *by E. E. Wright*..... 47
A Study of Methods for Determining the Settling Rate of Hydrated Lime Slurries, *by R. K. Thomas*..... 50
Fatigue Machines for Low Temperatures and for Miniature Specimens, *by W. N. Findley, P. G. Jones, W. I. Mitchell, and R. L. Sutherland*..... 53
Problems Accompanying the Introduction of the Newer Synthetic Fibers, *by J. H. Dillon*..... 56

NEWS ABOUT THE SOCIETY AND ITS COMMITTEES:

New Publications—Consolidation Testing, Surface and Subsurface Reconnaissance, Consumer Wants Symposium, Acoustical Materials Symposium, B-1 Compilation, Quality Control Manual, Engine Antifreezes, 1952 Year Book ..16–18
Personnel of Board of Directors and Board Committees..... 19
New Membership Certificates..... 19
Schedule of ASTM Meetings..... 21
Future District Meetings..... 22

TECHNICAL COMMITTEE NOTES:

C-1 Anniversary Dinner, E-14, C-1 and C-9 Statement on Air-Entraining Admixtures, Committee Officers..... 23–27
More Unsolved Problems..... 31
Personals, New Members, Necrology.....32–36

MISCELLANEOUS NEWS NOTES:

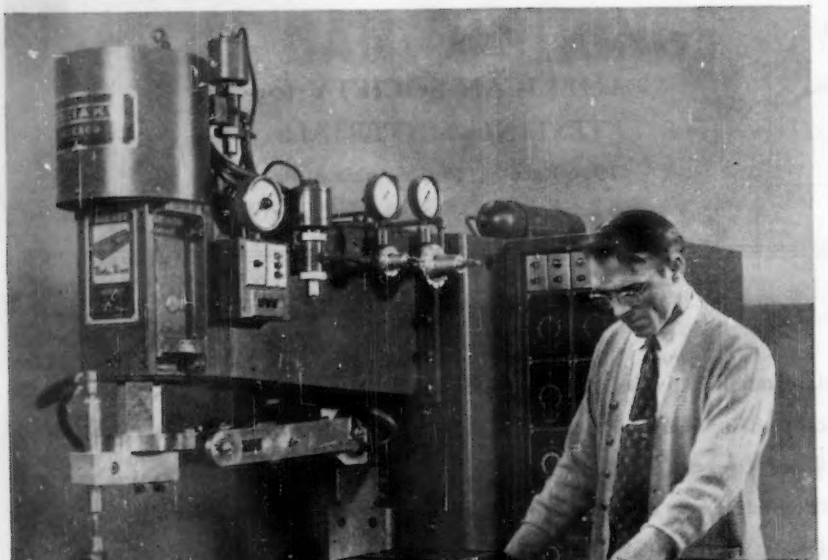
News of Laboratory Supplies and Testing Equipment..... 37
Calendar of Other Society Meetings 39
Book Reviews..... 40
Prize-Winning Photos from Eighth Photographic Exhibit....9, 13, 30, 34
Professional Cards.....62, 63
Index to Advertisers..... .79

ASTM Bulletin is indexed regularly by Engineering Index, Inc.

Telephone: Rittenhouse 6-5315 Cable Address: Testing, Philadelphia

SEPTEMBER—1952
No. 184

New Brush Welding Analyzer



Brush Analyzer (BL-213), used here on Sciaky 3-phase resistance welder, consists of Universal Amplifier, modified D-C Amplifier, and special Direct Writing Oscillograph. Resistance-sensitive force pickup is mounted on electrode, toroidal coil, current pickup on lower horn.

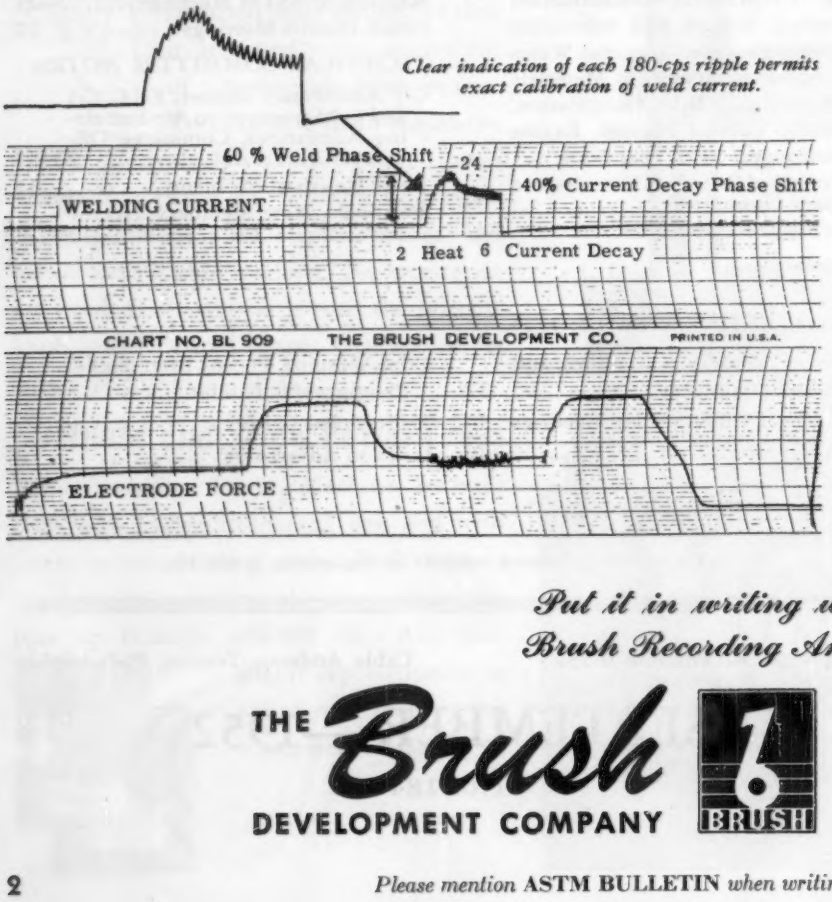
Gives you written proof you meet specifications

The new Brush Welding Analyzer helps you meet specifications without trial and error, and saves time in troubleshooting on three-phase resistance welders, single-phase resistance spot, projection, and seam welding machines.

Chart records, which are immediately available, show the magnitude and timing of variables, and give written proof of the calibration and consistency of operation of equipment. The dual chart records welding current and electrode force . . . showing contact gage settings, precompression force, weld force, rate of rise, forge force, and time of operation in milliseconds. Faulty firing of ignitron tubes or other difficulties are clearly indicated on the chart.

Investigate time-saving Brush Analyzers for welding analysis, and for studies of A-C or D-C voltages or currents, strains, displacements, light intensities, temperatures, and other static or dynamic conditions. Brush representatives are located throughout the U. S. In Canada: A. C. Wickman Ltd., Toronto.

For complete information write The Brush Development Co., Dept. J-36, 3405 Perkins Ave., Cleveland 14, Ohio.


Clear indication of each 180-cps ripple permits exact calibration of weld current.
60 % Weld Phase Shift
24
40% Current Decay Phase Shift
WELDING CURRENT
2 Heat 6 Current Decay
CHART NO. BL 909
THE BRUSH DEVELOPMENT CO.
PRINTED IN U.S.A.
ELECTRODE FORCE

Dual chart of welding current and electrode force. Timing, and other variables are easily determined. Chart is recorded instantaneously . . . saving time.

Put it in writing with a Brush Recording Analyzer

THE Brush DEVELOPMENT COMPANY

BRUSH

Piezoelectric Crystals and Ceramics
Magnetic Recording Equipment
Acoustic Devices
Ultrasonics
Industrial & Research Instruments

ASTM BULLETIN

"Promotion of Knowledge of Materials of Engineering, and Standardization of Specifications and Methods of Testing"

TELEPHONE—Rittenhouse 6-5315 R. E. Hess, Editor R. J. Painter, Associate Editor CABLE ADDRESS—TESTING, Philadelphia

Number 184 SEPTEMBER, 1952

Standardization Activities of Technical Committees

Much Developmental Work Under Way

In the September issues of the last three years, and before that in the August issues of the BULLETINS, there has been given a "round-up" of important standardization activities under way in the various technical committees. Again this year, the activity reports which follow are a "look-ahead" and should provide some conception of the tasks set up and already in progress.

The information is based in part on current reports of the technical committees and also in large measure on committee work programs sent in to Headquarters by the various officers. Much of this information is of interest to the membership broadly, and is also a great help to the Administrative Committee on Standards and the Staff.

Ferrous and Non-Ferrous Metals "A" and "B" Committees (see also "E" Groups)

A-1 Steel

One of the most important projects is being conducted by a task group of *Subcommittee XIII on Methods of Test*, the development of Proposed Definitions and Methods for the Mechanical Testing of Ferritic Steel Products. Material for this document has been drawn from mechanical testing procedures developed by the various subcommittees on structural steel, forgings, pipe and tubing, boiler plate and bars. Requirements for castings and sheet have also been developed and will be incorporated.

Subcommittee on Structural Steel is waiting recommendations from the American Welding Society on the chemistry of a structural steel suitable for welded building construction. While steel furnished to Specification A 7 has proven generally satisfactory for such construction, some consumer groups have found it necessary, especially in the heavier sections, to specify additional chemistry limitations.

A Proposed Tentative Specification for Cold Finished Heat Treated Alloy Steel Bars is being considered for recommendation to the Society for publication. The Tentative Specification for Alloy Steel Bars to End-Quench Hardenability Requirements (A 304) is being revised so that the numerous tables of hardenability data show clearly that the larger sizes of some of the steels cannot be used to obtain optimum properties. Also under consideration is the addition of a section on microstructure to the new Tentative Specification for Alloy-Steel Bars for Nitriding (A 355).

Subcommittee on Sheet and Strip has a Proposed Specification for Cold Rolled Sheets in its final stages and work is in preliminary stages on Proposed Specifications for Cold Rolled Sheets, Special Killed, Drawing Quality for Miscellaneous Parts. The matter of location of test samples in the Proposed Specifications for Sheets of Flange and Firebox Quality is still under consideration.

In the field of high and low temperature materials, the deletion of grades BA, BB, and BC from Specifications A 193 for Alloy Steel Bolting Material is being recommended, and it is also being recommended that the impact requirements for austenitic grades L8, L8c, and L8t be deleted from Specifications A 320 for Alloy Steel Bolting Materials for Low Temperature Service. Acid open hearth steel is being furnished to forging Specifications A 105 and A 181 and it will therefore be recommended to raise the silicon content from the present "0.30" to be "0.35" per cent.

Since Specifications A 335 for Seamless Alloy Steel Pipe for High Temperature Service has come into general use it is now planned to recommend that Specifications A 158, A 206, A 280, and A 315 be discontinued. Supplementary requirements to Specifications A 335 have required photomicrographs of grades P1, P2, and P12 only, but now all grades are being considered.

The grade designations for the pipe, tubing, forging, and welding fitting specifications have been reviewed and the result has been some recommended changes which will be incorporated in the next revision of the specifications.

Material furnished to Specifications A 325 for Quenched and Tempered Steel Bolts and Studs with Suitable Nuts and Plain Washers has become widely used for bolted construction in the structural steel field. A small group representative of the users of the material for these applications has recommended certain revisions in the specifications which are being considered by Committee A-1.

A-3 Cast Iron

The committee is actively engaged in outlining a program for establishing the high temperature properties of cast iron, which will include creep and stress rupture tests among others. At the 1952 annual meeting the Tentative Specifications for Chilled and White Iron Castings (A 360) were approved for publication, and now the committee is developing better methods for evaluation of the properties of chilled and gray cast irons when these structures occur in the same casting, as in chilled rolls. Also being investigated is the possibility of a standard practice from the numerous methods that are used to measure the "depth and chill" in gray cast iron. The nodular iron subcommittee has several problems before it, including methods of testing, standardization of test bars, suitability for pressure vessels, and possibly elevated temperature properties.

A-5 Corrosion of Iron and Steel

New sampling procedures are being studied in connection with three Committee A-5 specifications. Method

A 90, Weight of Coating on Zinc-Coated Iron or Steel Articles, and A 309, Weight and Composition of Coating on Long Terne Sheets by the Triple Spot Test, are under consideration to allow sampling of material from which full-size specimens as now outlined cannot be obtained. Weight of coating on narrow strip is also being studied. The third specification, A 93 for Zinc-Coated Iron or Steel Sheets, Coils and Cut Lengths, is being reviewed to permit sampling of coils narrower than the 2.25-in. test specimens.

Extensive revisions of requirements for Zinc-Coated Tie Wire (A 112) include deletion of uniformity of coating by the Preece test, addition of alternate packaging in fiberboard or kraft tubes or corrugated fiberboard boxes, and modification of sampling and rejection procedures.

An anticipated change in title and scope of A 123, Standard Specifications for Zinc (Hot Galvanized) Coating on Structural Steel Shapes, Plates, and Bars and Their Products, will include strip and shapes which are not necessarily structural. As a result of tests indicating that coating weights for tower bolts are of the same order as for the bolts used in pole line hardware, etc. the weight of coating section of A 123 will be revised to specify galvanizing of bolts and fasteners in accordance with A 153 (Galvanized Hardware). A 153 will be changed to include light steel shapes such as those used for window sash. An appendix will be added with statements of suggested procedures to check the embrittlement and malleability of steel used.

A-6 Magnetic Properties

WORK on the Magnetic Testing Manual is progressing and copies may be available within the next year.

Two new specifications are under consideration: for oriented electrical steel of AISI types M-7, M-8, M-9, and M-10; and for hot rolled electrical sheet. The committee is investigating the field of high frequency testing, specifically incorporating new devices into A 34, Methods of Testing Magnetic Materials. In addition data is being compiled on widely used magnetic materials to include the average and range for various properties, which would be helpful to designers and other technical men.

A-10 Iron-Chromium, Iron-Chromium-Nickel and Related Alloys

PROCUREMENT of specimens for the large-scale atmospheric corrosion test program has been seriously hampered by the steel strike and by the Korean situation. Several new subgroups have been appointed to attend to the details of carrying out this program.

A recommended practice for cleaning stainless steel surfaces has been prepared and committee approval is expected at the next meeting.

A special subgroup will institute tests in the Pittsburgh area to compare directly the performance of 17 per cent chromium and 18 per cent chromium–8 per cent nickel steels under conditions that will simulate the exposure of the steels on certain buildings in which they have been used extensively in the City of Pittsburgh. If results bear out early indications that such substitution does not seriously impair service life, large savings of nickel will result.

A program is under way to determine the effect of speed of testing on the tensile properties of Type 301 steel and also to study methods of determining yield strength as applied to various austenitic steels.

The study of sigma and its determination by metallographic examination has continued and a large number of etchants have been studied. A series of round-robin tests has been completed and a progress report is being prepared for inclusion in the annual report.

It is expected that a specification will soon be completed for stainless steel strand wire. Also under consideration is the inclusion of the low carbon grades (0.03 per cent carbon maximum) in Specifications A 167 and A 240, covering corrosion-resisting sheet, plate, and strip.

B-1 Wires for Electrical Conductors

ALTHOUGH the committee presented to the Society for approval the Tentative Method for Determination of Cross-Sectional Area of Stranded Conductors (B 263 - 52 T), it has been discovered that the method is not quite complete, and to eliminate any confusion the Committee has requested ASTM Headquarters not to publish the method until the necessary corrections can be agreed upon in the committee.

The Subcommittee on Methods of Test and Sampling Procedures is collecting data on tensile strength and elongation of soft copper wire to be used as a basis for revision of Specifications B 3, and is also considering the desirability of ultimately developing statistical sampling procedures for hard-drawn aluminum wire (Specifications B 230).

Also under consideration in another subcommittee is the addition of a 55 per cent conductivity alloy for bronze trolley wire and the addition of Fig. 9 deep section bronze trolley wire to Specifications B 9. Stiffness test requirements for magnet wire are being studied.

Proposed specifications for (1) annealed copper covered steel wire, (2) annealed or ¼ hard aluminum wire for telephone cable applications, and (3) aluminum magnet wire are being considered.

B-2 Non-Ferrous Metals and Alloys

SUPPLEMENTING the specifications for Iodide Titanium (B 266) and Titanium Ingot (B 264) and Titanium Strip, Sheet, Plate, Bar, Tube, Rod, and Wire (B 265), the committee is now considering specifications for titanium in the form of sponge.

The proposed specification for pig tin which had been prepared for recommendation to the Society this year was withheld because of points raised in discussion of the Tin Symposium held at the Annual Meeting. New specifications are being prepared for cored solder wire as well as Hastelloys B and C. Study which has been in progress for the past two years has continued on methods of test for continuity of coating to be included in the Standard Specifications for Lead-Coated Copper Sheets (B 101).

B-3 Corrosion of Non-Ferrous Metals and Alloys

THE acetic acid-salt spray test is currently under observation as applied to the testing of electroplated coatings on zinc-base die castings. Other activities in the field of corrosion testing include the cooperative tests being made by several committee members according to the Tentative Method of Total Immersion Testing of Non-Ferrous Metals (B 185). The B-3 sheet specimens on exposure at various test sites were removed during the past year. Weight loss determinations and tension tests will be made on the specimens. A final report on these tests is anticipated in 1953. Continuing its work on the calibration of the corrosivity of the atmospheres at the various ASTM test sites subcommittee VI has exposed samples at an additional location, namely Point Reyes.

B-4 Electrical-Heating, Resistance, and Related Alloys

COMMITTEE B-4 has developed chemical test methods for cathode nickel which include the analysis for copper, nickel, cobalt, iron, manganese, and titanium. These methods are currently under consideration by Committee E-3 before submission to the Society for approval. Spectrographic studies are also being actively continued in relation to cathode nickel. The approval of the Tentative Specifications for Round Chromium-Copper Wire for Electronic Devices (B 268) will lead to the preparation of specifications for other common wire products used in the radio tube and lamp fields. In this connection a recommended practice is being prepared for a method of test for weighing of fine wire.

Efforts are being made to standardize forms and sizes of electrical contacts. An important new edition of the "Bibliography and Abstracts on Electrical Contacts" is nearing publication and will incorporate the original book as well as the supplements which have appeared annually since the first publication in 1943.

B-5 Copper and Copper Alloys

NUMEROUS subjects are under consideration, including a revision of the hardness requirements in Specification B 133 on Copper Rod, Bar, and Shapes now before the main committee and the following items in subcommittees:

1. Proposed specification for copper and copper-alloy forgings.
2. Additional yield strength values for copper and copper-alloy materials used for ASME Boiler Code requirements.
3. Requirements for 10 per cent and 12 per cent nickel silver sheet, rod, and wire.

4. Revision of dimensional tolerances in Specifications B 111 on condenser tube.

5. Dimensional tolerances for rectangular and square tubes in Specification B 188 on copper bus tube.

6. Specification for copper refrigeration service tube.

7. Preparation of revised straightness tolerances in Specification B 135 on brass tube.

8. Preparation of a classification of wrought copper-base alloys.

9. In the General Requirements Specifications B 248, B 249, B 250, and B 251 study of sampling and retest requirements in reference to statistical quality control.

10. Preparation of pipe specifications for copper, admiralty, copper-silicon alloys, and copper-nickel alloys at the behest of the Chemical Industry Correlating Committee of ASA.

11. Specification of manganese brass sheet for resistance welding.

12. A review of the copper-silicon alloy Specifications B 96, B 97, B 98, and B 99 with respect to possible simplification in the chemical requirements and list of alloys.

13. Specification for a group of copper-nickel-tin-zinc casting alloys.

14. Preparation of a Tentative Recommended Code of Procedure for the Inspection of Copper-Base Alloy Sand Castings.

15. Preparation of a standard method of measuring dimensions, such as thickness, width, diameter, and length.

B-6 Die-Cast Metals and Alloys

INCREASED demand by users of aluminum and magnesium castings for a guide in the selection of alloys for particular applications has led to the committee's consideration of the advisability of including such data for the die-casting alloys in the appendix to B 85, Tentative Specifications for Aluminum-Base Alloy Die Castings, making such revisions in the typical mechanical properties of the alloys as are in line with more recent data.

Additional atmospheric exposure tests are planned on the extra specimens prepared in connection with the 1939 program of magnesium and zinc-alloy test bars from which it has been concluded, on the basis of mechanical property tests, that the zinc limit in aluminum alloy SC5 and SC6 could be raised safely from 0.6 to 1 per cent.

B-7 Light Metals and Alloys, Cast and Wrought

WORK has been initiated on specifications for anodic coatings on aluminum and study is continuing on the investigation of statistical sampling methods as well as testing for mechanical properties.

Supplementing the Recommended Practice for Codification of Light Metals and Alloys, Cast and Wrought (B 275) a recommended practice for codification of tempers is currently in preparation.

The test specimens of 30 aluminum and 8 magnesium alloys (more than 1650 specimens at each location) have been exposed at New York City, State College, Pa., and Kure Beach, N. C. Exposure at Point Reyes, Calif., should be completed within a few months. This comprehensive program is planned not only to evaluate the corrosion resistance of various alloys of each metal but will result in comparative quantitative data on aluminum and magnesium exposed under identical conditions. The tests include flat stock, spot-welded, gas-welded, arc-welded and riveted aluminum and magnesium specimens. Thicknesses of the flat specimens range from 0.064 to 0.25 in.

Tension specimens of both metals are included in the form of sand castings. A number of permanent-mold aluminum castings are included.

Details of the test program will be included in the 1953 report of the committee.

B-8 Electrodeposited Metallic Coatings

IN COOPERATION with parallel efforts of the editorial board of the American Electroplaters Society and other interested organizations Committee B-8 is developing a glossary of terms used in plating, polishing, and allied operations. The committee will continue to review proposed Federal specifications pertaining to electroplating. In the interest of uniformity within the committee a suggested format for recommended practices for the preparation of materials for electroplating is being prepared.

Additional test panels are being prepared for exposure in connection with copper-nickel-chromium exposure tests. In addition to these copper-nickel-chromium panels zinc- and cadmium-plated panels will be exposed on which the electroplated deposits have been given supplemental treatments. In connection with these exposure tests present methods now used in rating test panels will be reviewed with particular attention being given to the placing of proper emphasis on various defects as they relate to the true protective value of the coatings.

Properties of electrodeposited coatings currently under study include thickness, hardness, adhesion, brittleness, and luster. Four new recommended practices are anticipated in the near future as follows:

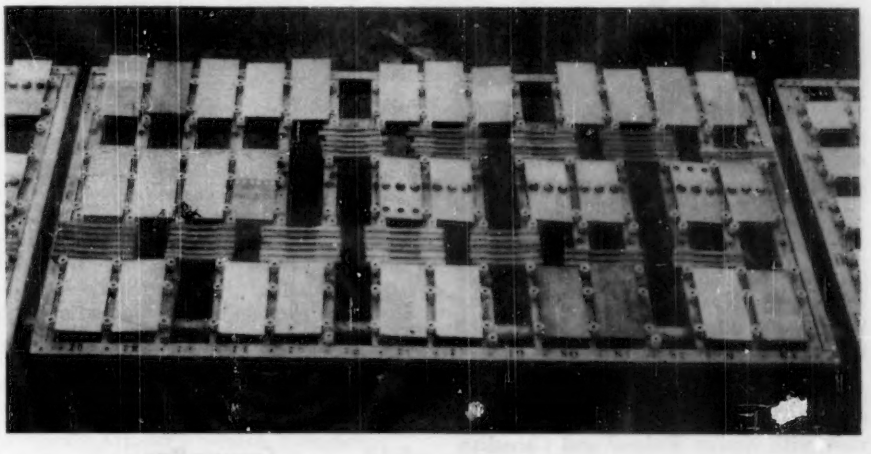
1. Preparation of copper and copper base alloys for electroplating.
2. Plating on plastics.
3. Preparation of lead and lead alloys for electroplating.
4. Preparation of malleable and gray iron for electroplating.

Cementitious, Ceramic, Concrete and Masonry Materials—"C" Committees

C-1 Cement

THE revision of the Standard Specifications for Masonry Cement (C 91), involving the inclusion of an expansion limit as measured by the autoclave test at 48 hr, is of most concern to Committee C-1 at the present time. Numerous instances of abnormal expansion in brick masonry walls using masonry cement has led to the proposed revision, but agreement on the proper per cent of expansion limit to be allowed has not proven to be an easy matter. Action is contemplated on revised limit for entrained air in the Specification for Portland Cement (C 150), the proposal being to raise the present limit from 12 to 15 per cent. The Working Committee on Test Methods for Air-Entrainment has been asked to develop more satisfactory test methods for measuring air entrainment of standard mortars. Further revisions in proposed specifications for fly ash and for portland-fly ash cement are now under consideration.

It is expected that a final report of recent cooperative tests on the measurement of air-entraining properties of cements will be available at the time of the October meeting of the committe. In the study of test procedures for determining SO_3 content, 13



A section of Committee B-7's aluminum and magnesium corrosion specimens exposed at ASTM'S State College, Pa., exposure site. Shown here are welded, riveted, flat stock, and tension specimens, 0.064 to 0.25 in. thick

cement mills have submitted reports on a leach test for calcium sulfate for hydrated cement mortar using cements treated with various amounts of gypsum. A report is being prepared at the National Bureau of Standards covering an extensive investigation of sampling methods, and the preparation of the long awaited standard chemical sample of portland cement is planned as a Fall activity of the Bureau. Studies are being continued on the development of important methods for manganese removal for cement analysis. A related study of the flame photometer method is expected to furnish data for a proposed revision of the tentative methods C 228, to allow the use of various makes of flame photometers. More details on the current work of the committee were published in the July issue of the ASTM BULLETIN.

C-3 Chemical Resistant Mortars

Refer to July Bulletin.

C-7 Lime

THE Standard Specifications for Quicklime for Structural Purposes (C 5), one of the oldest standards in the lime field, is now being reviewed for possible need of revision in terms of present day usage of this material. Two other old standards covering Quicklime and Hydrated Lime for Cooking of Rags in Paper Manufacture (C 45) and Hydrated Lime for Varnish Manufacture (C 47), are also being critically reviewed, particularly with respect to their retention, because of the limited usage of lime for these purposes. Round-robin tests have been proposed in order to determine a satisfactory method of test for determining soundness of lime by the autoclave or other methods. Work is continuing on the development of specifications for lime as used in leather processing and in silica and sand-lime brick.

C-8 Refractories

IN its consideration of load tests, the committee is continuing the study of third-point loading to determine its accuracy for measuring true tensile strength compared with the modulus of rupture test as presently conducted. Tests are being conducted on kaolin and alumina mixtures as a mortar in the panel spalling test, in which changes in various requirements, such as constancy of temperature, are under consideration. In studying the effect of temperature, variation in the length and thickness of test cones is being reviewed. Five basic methods for determining bulk density of granular refractories are being studied for establishing entirely new test procedure. A current practice in the designation of "coarse" and "fine" particles for castable refractories is being examined, as well as the amount of tamping that is best for the preparation of test specimens.

A proposed specification for particle size for single and double screen ground refractory materials is still undergoing review with similar Federal and Canadian Government specifications being studied. A reclassification of high-duty brick and super-duty brick is being considered with respect to spalling characteristics. A research program on special refractories is still under consideration, pending arrangements for the raising of a special fund for this purpose. A new field of activity has been inaugurated through the formulation of an additional subcommittee for the purpose of defining, classifying, and developing tests for basic granular refractories.

C-9 Concrete and Concrete Aggregates

A proposed method for determining the amount of entrained air in fresh concrete to replace the present methods is under consideration. This method may possibly include the gravimetric, volumetric, and pressure methods as alternates. Two existing standard methods dealing with physical characteristics of aggregates will be studied during the coming year, these being the Standard Method of Test for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate (C 88) and Standard Method of Test for Organic Impurities in Sands for Concrete (C 40). Continued attention is being given to a complete revision of the Standard Specification for Lightweight Aggregate for Concrete (C 130). Further revisions of the Test for Water Retention Efficiency of Liquid Membrane-Forming Compounds and Impermeable Sheet Materials for Curing Concrete (C 156) are being considered. Also a cooperative test program to determine the concordance, which may be secured by use of procedures based on this method, is being conducted.

It has not been found possible to obtain agreement on a single-purpose specification for fly ash, and the proper subcommittee will now attempt to draft two specifications; one for fly ash with stringent requirements, especially in regard to ignition loss, and the other for fly ash for use where less stringent requirements are needed.

Further details of activities in the committee can be found in an item appearing in the July issue of the BULLETIN, which reviews the recent meeting of the committee.

C-11 Gypsum

Refer to July Bulletin.

C-12 Mortars for Unit Masonry

FURTHER revisions will be studied in the Tentative Specifications for Mortar for Unit Masonry (C 270 T) as a result of recommendations received from other interested committees of the Society. One particular suggestion is a change in the nomenclature of designating the several types of mortar in Tables I and II. Substantial progress has been made in the development of a proposed method of test for efflorescence, as a result of a cooperative test program, and it is expected that this work will approach a conclusion during the coming year.

C-13 Concrete Pipe

THE three major projects which will receive attention during the next year deal with new standards in the field of low head pressure pipe, extra strength non-reinforced pipe, and a proposed recommended practice for laying and backfilling concrete pipe. It was the feeling of the committee that one general specification for low head pressure concrete pipe would be too general in nature, and a subcommittee was instructed to develop a specification for reinforced concrete low head pressure sewer pipe only. In addition, the subcommittee was also instructed to consider specifications for other types of low head pressure pipe.

Work is scheduled on specifications for extra-strength non-reinforced concrete pipe corresponding to a similar type of clay pipe, which it is felt desirable to add to the group of ASTM specifications on concrete pipe.

An attempt will be made to enlist other interested organizations, such as the American Association of State Highway Officials and the American Public Works Assn., in joint efforts to prepare recommended practices for laying concrete culvert pipe, as well as for concrete sewer pipe.

C-14 Glass and Glass Products

TEST methods are being reviewed for measuring thermal expansion, annealing, and strain point, and softening point of glass, and definite reports are expected at the Fall meeting of the committee.

A series of round-robin tests is being planned to establish the value of selected test methods. Further clarification of the significance of the Method for Testing Flexure of Glass (C 158) is planned to establish more definitely the use of this method as a criterion for the quality of glass. Study is also being given to the development of an impact test.

C-15 Manufactured Masonry Units

A new type of clay building unit which, because of volume of voids and cross-sectional design, does not fall either into a brick or hollow-tile classification is being studied. A special subcommittee has been authorized to study the merits of this product and the advisability of preparing an ASTM standard for it.

A revision in the Standard Methods of Sampling and Testing Structural Clay Tile (C 112), which will add a section on measurement of sizes and warpage is being considered. Several minor revisions of the Tentative Specifications for Drain Tile (C 4 T) are being considered before this tentative is advanced to standard. The present tentative replaces the standard which had been in existence without change since 1924.

C-16 Thermal Insulating Materials

SEVERAL new methods and specifications on block and pipe insulation are in the final stages of development. Products covered by these proposed tentatives include laminated asbestos paper type insulation, 85 per cent magnesia block and pipe, mineral wool block or board for low temperatures, mineral wool

block or board for elevated temperatures, mineral wool board for roofs, and diatomaceous earth block and pipe. Test methods under consideration for structural insulating board include a racking load test for structural insulation board sheathed wall panels and a test for determining flame resistance of interior finish materials. Linear expansion and nail-loading test procedures are also in progress of development.

Proposed test methods have been prepared and are now being reviewed for determining dried adhesion and compressive-hardness of thermal insulating cement. A means of measuring plasticity and wet-adhesion is also under consideration. In addition to a new tentative method of test for thermal conductivity of pipe insulation, which is now receiving final review, the two existing test methods for measuring thermal conductivity are in various stages of review. These two methods are the guarded hot plate method (C 177) and the guarded hot box method (C 236 T).

Round-robin tests based on a draft of a simple inexpensive method for measuring specific heat of insulating materials are being conducted. A method for determining a maximum use-temperature limit of high-temperature insulations is in a final stage of development. Standardization of a method for evaluating emissivity of refractive insulations is also under study. Work has been completed on the determination of field clearance between pipe and insulation, and a recommended clearance has been agreed upon in a tentative specification. The writing of this complete specification is now under way.

Data from tests at several laboratories using two types of impact machines will be the basis for developing a method for evaluating certain characteristics of insulating blocks to obtain an index by which handleability can be gaged.

C-17 Asbestos-Cement Products

With the acceptance by the Society of the Tentative Specification for Asbestos Cement Pressure Pipe (C 296 T) the committee will now prepare a statement on significance of tests for inclusion in this specification. Additional research is being developed to obtain data upon which to verify suggested changes in the four existing tentative specifications covering roofing and siding sheets and shingles. The handleability of asbestos-cement products is a subject of continued investigation with the objective of preparing an ASTM standard which will aid in measuring this property.

C-18 Natural Building Stones

Further basic research has been found necessary in order to establish the relation of structural characteristics of natural building stone. The committee is closely following research which will be continued at Mellon Institute on domestic marbles, this work being sponsored by the National Association of Marble Producers. The development of simulated service tests to evaluate durability of various types of natural building stones has not yet been accomplished to the satisfaction of the committee.

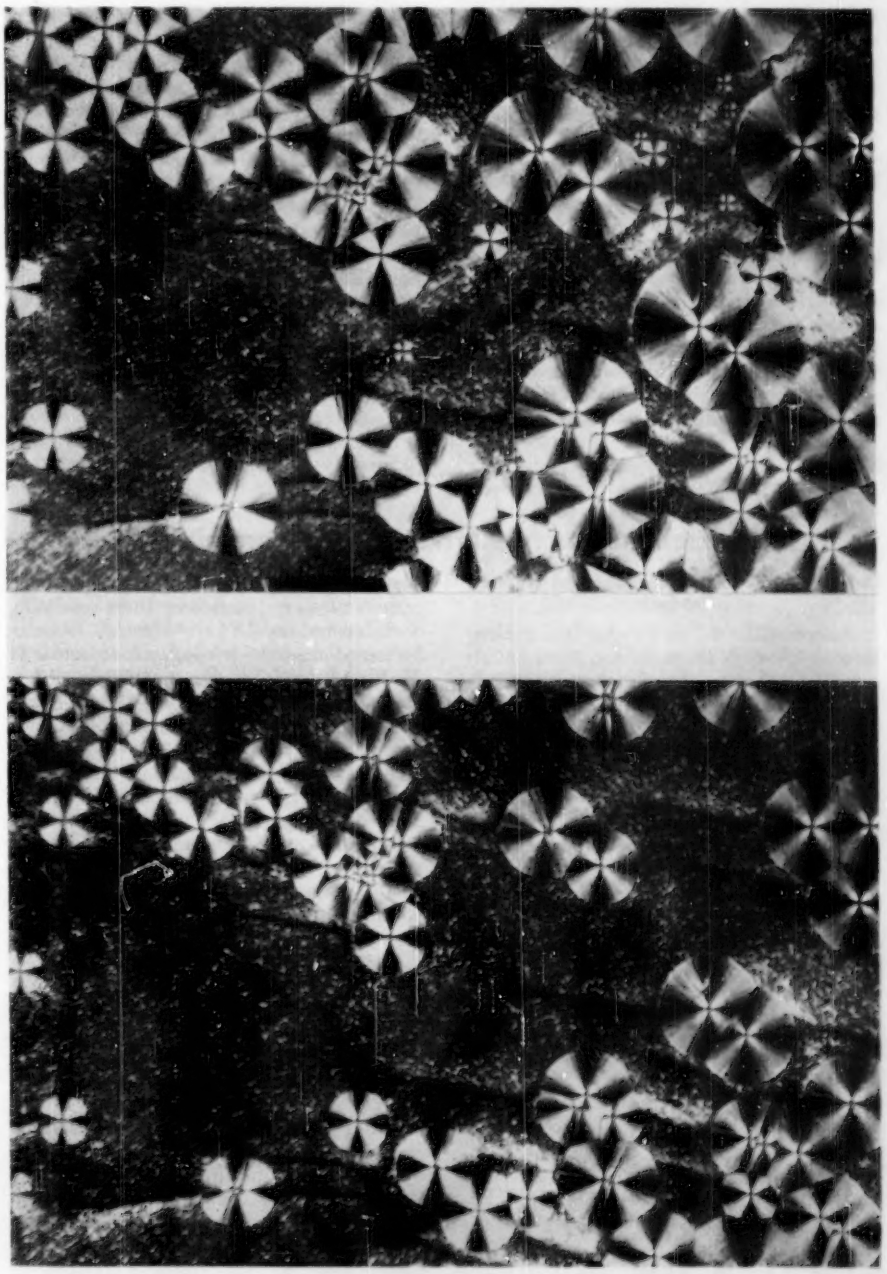
The several task groups which have been developing specifications for granite, roofing slate, marble, and limestone have been granted an extension of time due to the necessary research required.

C-19 Structural Sandwich Constructions

The development of test methods in this field has been along two lines, one in terms of the measurement of properties of basic materials and the other on properties of the basic sandwich construction. For basic materials, test methods are now being formulated to determine heat distortion, bondability, dimensional stability, and thermal expansion. A proposed flexure test method is still under consideration for use with basic sandwich constructions. Plans are still under development for a program of outdoor exposure tests using cubicle designed specimens.

C-20 Acoustical Materials

There are still variables to be solved in the development of a standard method for measuring sound absorption of



Polymorphic Transformation

First prize, Particles Section, Eighth ASTM Photographic Exhibit, by Walter C. McCrone, Armour Research Foundation.

Successive views (five seconds apart) of the polymorphic transformation of cholesteryl acetate; the high temperature liquid crystalline modification transforms to the solid spherites.

acoustical materials by the reverberation chamber method and study of this type of test procedure is continuing. The impedance tube and box methods are also under consideration. The committee is also following closely the development of a method for field measurements of sound absorption. The committee is observing work in Committee C-16 on Thermal Insulating Materials and Committee E-5 on Fire Tests of Materials and Constructions on the development of a small-scale fire test for possible adaptation to acoustical materials. This involves the modification of a Federal Specification Method, SS-A-118a, and a small-scale tunnel test. Two task groups are continuing research in the effects of staining and painting acoustical materials. Application problems are centering around test methods for adhesives. Various significant basic physical properties are being reviewed further for the purpose of establishing standard methods, such as flow resistance, light reflection, appearance, thermal properties, and strength.

C-21 Ceramic Whiteware

A group of 23 additional definitions of terms and 12 revisions is under further review. A study of the effect of kiln schedules on the Curie point is being made through the distribution of a series of barium titanate disks to several companies. Further revisions are being made to test procedures for the determination of true specific gravity, modulus of rupture of fired dry-pressed specimens, and linear thermal expansion. Test methods for sieve analysis, water content, chemical analysis, sampling, and shrinkage of clays are being reviewed by the proper working groups.

Research work under way includes an investigation of the modulus of rupture test, studies of the potential usefulness of the modulus of elasticity test, and the evaluation of test methods for determining the sub-sieve sizes of flint.

C-22 Porcelain Enamel

Two task groups have been appointed to carry on investigations on the development and appraisal of thermal shock tests and the short and long-term effect of porcelain enamels on the underlying metals when subjected to elevated temperatures. A method for the determination of reflectivity is nearing completion, and the development of tentative tests for warpage of enameling iron, the effect of mill-added water composition on porcelain enamel, porcelain enamel consistency, and fusion flow methods, are in progress. Several methods for finished products are approaching the final stages of preparation, including proposed methods for warpage, gloss, abrasion, and adherence.

Miscellaneous Materials—"D" Committees

D-1 Paint, Varnish, Lacquer and Related Products

Subcommittee II on Drying Oils is continuing its work on sampling, total iodine number, and the spectrophotometric analysis of oils. It recommends the withdrawal of the Specifications for Perilla Oil, (D 125 - 48), which is no longer an article of commerce.

Subcommittee IV on Traffic Paints is working on an accelerated suspension test for traffic paints using a hot-cold test procedure: an accelerated test for durability of traffic paints; and clarity, chemical stability, and wettability of glass beads. It also plans to undertake a program of cooperative laboratory testing with the Highway Departments of the states of Pennsylvania, New Jersey, Virginia, and Michigan on the sieve analysis of glass spheres to determine the preferred order of screening, and on the crushing resistance of glass spheres to determine the precision or reproducibility of the new tentative method of test.

Subcommittee VII on Accelerated Tests for Protective Coatings will continue its search for lintless wiping cloths, its work on a method of test for cleanliness, water fog test, and a method for rating blistering by means of photographic standards.

Subcommittee VIII on Methods of Chemical Analysis of Paint Materials is revising the Tentative Method of Chemical Analysis of White Pigments (D 34 - 51 T), specifically to the analysis of white lead pigments and the determination of titanium in titanium dioxide by three methods.

Subcommittee IX on Varnish has determined that the present color standards for liquid varnishes are unsatisfactory because of lack of reproducibility and because minor variations in pH and minor contamination by foreign substances result in color differences. It plans to match the present Hellige color standards by potassium chloroplatinate solutions, maintaining the present spacing of the color standards. The subcommittee also plans to do cooperative work with other subcommittees of D-1 for determining the sheen and gloss of clear varnish films. The Kauri-Reduction test for flexibility in the Methods of Testing Varnishes (D 154-50) is to be reviewed. It has also concluded its work on a test for the exterior exposure of varnishes and will submit the proposed method to Committee D-1 in the near future.

Other plans call for the organization of further work on exposure with particular attention to edge effects and to the influence of varieties of woods. Cooperative work on the abrasion and wear resistance of floor varnishes is planned; this program includes application of the varnishes to floor panels or areas for foot traffic tests and to panels of wood and steel for accelerated abrasion tests.

Subcommittee X on Optical Properties is preparing a method for the measurement of color difference with the Hunter multipurpose reflectometer. New working groups have been formed to study color difference measurements with other instruments used in the paint and lacquer industry with the objective of developing methods of test for such instruments. The instruments under test are the General Electric recording spectrophotometer, the Hunter color difference meter and the Beckman spectrophotometer. Similar work is planned on the differential colorimeter and the color-eye.

Cooperative testing is in progress to evaluate a method for hiding power; and a survey regarding the numerical gloss ranges which are considered to represent the present ASTM verbal classification, is being conducted. A review of these gloss classifications will be carried out by a group to be organized during the year. In addition, the definitions group is being reactivated to prepare an acceptable definition of gloss. A critical review of the Standard Method of Test for Tinting Strength of White Pigments (D 332 - 36) has been started.

Subcommittee XI on Resins has in preparation two new methods for the analysis of phthalic anhydride in the presence of other interfering dibasic acids; one method is a gravimetric method, the other, spectrographic. Work is continuing on tentative specifications and a method of test for "high gravity glycerine" for use in alkyd and synthetic resins. Further work is planned on the basis of results obtained in a round-robin test for extending the foil method for nonvolatile determination to heat-sensitive resins. Work is also continuing on determining resin-solution viscosities. The mortar and pestle assembly procedure in Test for Softening Point by Ring and Ball Apparatus (E 28 - 51 T) is being further investigated. Methods for the determination of polyvinyl butyral, polyvinyl acetate, and polyvinyl alcohol are being explored.

Subcommittee XV on Specifications for Pigments will soon complete its proposed revision of the Specifications for Magnesium Silicate Pigment (D 605 - 42). It has also begun a study of particle size distribution of pigmentary materials.

The recently organized *Subcommittee XVI on Printing Inks* is bringing to a conclusion its first proposed Method for the Determination of Fineness of Grind. This subcommittee is continuing the work on definitions, methods review, rubproofness, rheology, drying time, and paper-ink relations.

Subcommittee XVIII on Physical Properties of Materials is continuing to develop a new method of test for the oil absorption of pigments. It is also continuing its work on adhesion consistency of pastes, hardness of organic films, permeability of paint films, fire retardency of paint films, and flow properties. A new working group will be formed to study and develop a method for the measurement of film thickness of dry coatings applied to non-magnetic surfaces. The subcommittee is also considering the initiation of work on the development of standard methods for the determination of weight per gallon and

specific gravity or density of liquids as well as the specific gravity or density of solids other than pigments.

Subcommittee XXV on Cellulosic Coatings will present to Committee D-1 in the coming year revisions of tests for drying time, gloss, non-volatile matter, and consistency in Methods of Testing Nitrocellulose Clear Lacquers and Lacquer Enamels (D 333 - 40).

Subcommittee XXIX on Painting of Metals is continuing its work on recommendations for the surface preparation of aluminum and also on a method to classify ferrous surfaces for painting, to be illustrated with photographs.

D-3 Gaseous Fuels

At the July meeting of this committee and four subcommittees at State College, Pa., considerable progress was made on the various projects under study. There was an excellent attendance.

A new Tentative Method of Sampling Manufactured Gas was approved for submission to committee letter ballot. This method describes procedures for securing representative samples of manufactured gas, and correlates the size or type of sample with the analysis to be done subsequently on that sample. In collecting samples of manufactured gas, consideration must be given to the purposes for which the samples are to be used and the conditions under which they must be secured. Consideration must also be given to the volume of sample required for the purpose intended; to the size and length of the sampling line; to the size and design of containers. Account must also be taken of the possible constituents in the gas with reference to any action upon the material of which the lines, containers, and auxiliary equipment are constructed. The procedure should give results which can be duplicated. Unless a representative sample has been obtained, any subsequent analytical test regardless of its accuracy will be erroneous and misleading. This proposed method takes into account these considerations.

A new Tentative Method of Sampling Liquefied Petroleum Gases was also approved for submission to committee letter ballot. This method, developed with Committee D-2 describes procedures for obtaining samples of liquefied petroleum gases, such as propane, butane, or mixtures thereof, in containers other than those used in laboratory testing apparatus.

The Tentative Method for Sampling Natural Gas (D 1145 - 50 T) was approved for adoption as standard, since no criticisms of this procedure had been received since the method was first issued two years ago. This method will also be submitted to the ASA for approval, as American Standard.

Plans were made for study of a procedure for determining water vapor in natural gas by a direct chemical method. This method was described in a paper by W. F. Brickell presented at the Production and Chemical Conference, American Gas Assn., May, 1952. Water vapor is an important factor in the transmission of natural gas. Processes through which the gas may pass on the way to its ultimate destination include transmission, compression, catalytic conversion, extraction, and dehydration. Each of these processes is affected, in one way or another, by the water vapor content of the gas. Consequently, a knowledge of the water vapor content at various processing stages is essential to modern production and distribution of natural gas.

Subcommittee II on Measurement of Gaseous Samples gave consideration to the methods of calibration of meters described in the Tentative Methods for Measurement of Gaseous Fuel Samples (D 1071 - 49 T). The subcommittee believes that a better method of calibration can be developed, and will work on this project jointly with Subcommittee III on Determination of Calorific Value of Gaseous Fuels since this matter is also of interest in connection with the Standard Method of Test for Calorific Value of Gaseous Fuels by the Water-Flow Calorimeter (D 900 - 48).

The Methods of Test for Specific Gravity of Gaseous Fuels (D 1070 - 52) were revised and are being voted upon for adoption as ASTM Standard this year. Action was taken to recommend to the Society that these methods be submitted to the ASA for approval as American Standard. Consideration is now being given by the ASA to approval as American Standard of the ASTM Method of Test for Calorific Value of Gaseous Fuels by the Water-Flow Calorimeter (D 900 - 48).

Plans were made for a rather extensive cooperative program for studying the determination of sulfur in gaseous fuels. Four different procedures will be studied by several cooperating laboratories. These will include the referee method for sulfur, the method of the Institute of Gas Technology, and the Phillips Petroleum Method, also a procedure developed by C. W. Wilson, of the Consolidated Gas, Electric Light and Power Co., of Baltimore.

Action was taken to submit to committee vote a recommendation that the Tentative Method of Test for Water Vapor Content of Gaseous Fuels by Measurement of Dew-Point Temperature (D 1142 - 50 T) be proposed as ASTM Standard. If adopted, this method will also be submitted to the ASA for approval as American Standard.

D-4 Road and Paving Materials

The standardization work underway in Committee D-4 on Road and Paving Materials is summarized by the following subcommittee projects.

Subcommittee B-2 on Physical Tests for Compressed Bituminous Mixtures, is continuing its cooperation with the Triaxial Institute. The latter organization is engaged in fundamental studies, at present concentrating on methods for formation of specimens and the influence of compaction methods on the physical properties of compacted specimens. The subcommittee has held a number of meetings for the presentation and discussion of fundamental data bearing on the physical testing of bituminous mixtures, and is considering the standardization of additional procedures.

Subcommittee B-3 on Distillation Tests plans to conduct a series of cooperative tests by the Standard Method of Test for Distillation of Tar Products for the purpose of obtaining data for preparation of a statement on reproducibility. This subcommittee is also reviewing critically the proposed revisions of the standard method of Test for Water in Petroleum Products and Other Bituminous Materials (D 95) which are also being considered by Committee D-2 on Petroleum Products and Lubricants. The important feature of suggested revisions is to provide for the use of glass-to-glass connections.

Subcommittee B-7 on Viscosity and Float Tests is conducting cooperative tests to obtain data on reproducibility of the Engler

Present at the meeting of Subcommittee II on Drying Oils of Committee D-1 on Paint, Varnish, Lacquer, and Related Products were, left to right: Sidney Singer, Cargill, Inc.; E. C. Gallagher and O. P. Mueller, National Lead Co.; S. S. Gutkin, Cargill, Inc.; George Walker, Minnesota Linseed Oil Co.; Richard Nagle, Spencer Kellogg & Sons; Blaine Seaborn, Cargill, Inc.; R. L. Terrill, Spencer Kellogg & Sons; Sam White, Congoleum Nairn Co.; and F. G. Bentz, E. I. DuPont de Nemours Co., Inc.

specific viscosity test, for which a proposed tentative method has been prepared.

Subcommittee B-12 on Structural Properties of Mineral Aggregates is considering the effect of aggregates on slipperiness of road surfaces, methods of measuring the angularity of fine and coarse aggregates, and thermal properties of aggregates.

Subcommittee B-16 on Setting Qualities of Bituminous Materials is continuing its cooperative test program to develop a method to measure the curing properties of bituminous materials, with particular attention to rapid-curing and medium-curing cut-back materials. Results now available indicate the need for further standardization of apparatus and technique.

Subcommittee B-19 on Accelerated Tests for Durability of Bituminous Materials has reviewed a number of thin film oven and weathering tests and proposes to organize a cooperative testing program to study the thin film oven test.

Subcommittee B-25 on Effect of Water on Compressed Bituminous Mixtures plans to undertake cooperative tests on expanding the use of Test for Effect of Water on Cohesion of Compacted Bituminous Mixtures (D 1075) to the evaluation of bituminous mixtures containing liquid binders. This subcommittee has conducted several series of tests in the development of the present tentative method, and plans to prepare a summary of these tests for publication.

Subcommittee B-26 on Effect of Water on Bituminous Coated Aggregates has presented a critical review of "stripping tests" and plans to investigate newly-suggested techniques for the examination of test mixtures.

Subcommittee D-3 on Expansion Joint Materials is formulating requirements for materials not at present covered by ASTM specifications, particularly joint sealers for cold application.

D-5 Coal and Coke

Work is continuing in revising the present standard methods for determination of carbon, hydrogen, and nitrogen in coal. It is also planned to investigate the volatile matter determination as applied to low-rank coals which require a modification of the usual procedure. Other active problems are the determination of inherent or bed moisture in coal, the determination of ash fusibility in an oxidizing atmosphere, and the determination of mineral carbonates in coal.

In cooperation with a group representing the Edison Electric Institute, sampling experiments are being made at large utility power plants to assemble data with a view eventually of formulating specifications for the continuous sampling of coal at large coal handling systems such as are found in most utility power generating plants.

The Subcommittee on Plasticity and Swelling of Coal is continuing an investigation of the Gieseler test for determination of plastic properties of coal when heated in the absence of air. This test procedure is sensitive to small variations in instrument design and requires rigid specifications as to both equipment and procedure.

A new Subcommittee on Physical Tests of Coke has been organized to make a complete review of all committee-sponsored tests in this field. A number of coke experts from industry are to cooperate in this project. Many of the ASTM tests for coke were standardized years ago and apparently need revision in view of more recent information regarding optimum use properties of coke, especially in the metallurgical field.

The committee expects to cooperate in the work of a Technical Committee on Solid Mineral Fuels of the International Organization for Standardization. This international committee is reviewing various national standards for sampling, analysis, and testing of coal and coke with a view to reaching agreement on certain fundamental factors which should be incorporated into standards, especially with regard to methods which are more or less empirical in nature.

D-6 Paper and Paper Products

Activities continue to be two-fold in respect to the development of test methods. The proper subcommittee is not only continuing its critical study of various test methods for paper and paper products which have been adopted by other organizations but is also working on new test methods. Methods for determining light fastness, moisture expansivity, and erasability are now under development. Revisions of several existing test methods, including conditioning (D 685), bursting strength (D 774), wet tensile breaking strength (D 829), resistance to passage of air (D 726), moisture (D 644), grease resistance (D 722), basis weight (D 646), and sampling (D 585) are being studied.

Procedures for determination of immersion number and wet bursting strength on container board are now being developed. A method for flat crushed test of fiberboard is also nearing completion.

D-7 Wood

Research studies are continuing on basic principles of structural grading. The results of these studies will be used in a proposed revision of Tentative Method for Establishing Structural Grades of Lumber (D 245 T). In the field of timber preservatives proposed specifications are being considered for creosote distillate, non-standard preservatives, and for creosote and creosote coal-tar solutions. Soluble tests for creosote and creosote coal-tar solutions, other than benzol tests, are being studied. Details of the test method for modified woods (D 805) are being considered for improvement. A supplementary specification for modified wood is being prepared which will include definitions of terms and ranges in physical and mechanical properties of the most commonly used modified woods. A subcommittee is studying new methods of acceptance testing to replace performance tests by means of specifications for retention and penetration of fire retardants. Modifications of the existing methods of chemical analysis are expected as a result of a survey, in order to make these methods more applicable to the various types of wood specimens used in commercial practice.

D-8 Bituminous Waterproofing and Roofing Materials

The subject of a blistering test is still before the task group studying this condition. The several specifications and test methods for prepared roofings and shingles are being reviewed for possible revision, including D 224, D 225, and D 228. A series of round-robin tests is planned on consistency of bituminous cut-back coatings. The returns from a questionnaire, dealing with the conditions of loading deformation and temperature, causing crack formations in roofing and waterproofing materials will be studied by a subcommittee. A proposed method of preparing panels for use in accelerated weathering tests based on the Press Method is receiving attention, and a further revision is now under way. Activity which is allied to the preparation of specimens is also that of outdoor exposure of panels to determine changes due to decomposition of roofing materials. Several procedures are being studied for measuring the physical changes which occur during the weathering of asphalts.

The results of two series of round-robin tests for the staining properties of asphalts, using a pressure method, are being summarized for more precise analysis. Further investigation will be made to ascertain the chief causes of deviation found in cooperative test series which have been made for measuring compatibility of bituminous materials.

D-10 Shipping Containers

An additional group of definitions of terms relating to interior packing are being reviewed by the proper subcommittee for presentation at the Fall meeting. Refinements in the existing vibration test (D 999 T) are being considered through a research program to measure shock and vibration on various portions of container and merchandise on selected packages by means of strain gages and an oscillograph. The completion of a puncture resistance test method for multiwall paper shipping sacks is being delayed because of variables of an uncertain nature. A task group will give further study to these factors.

A task group has been assigned the project of studying the existing revolving drum test (D 782) for the purpose of minimizing the instrumental and operational variables. Performance standards will continue to receive much attention with task groups considering the vibration test (D 999), compression test (D 642) and a correlation of the drop test (D 775) to the conbur (incline impact) test (D 880). The sequence of tests will continue to be stud-

ied for the purpose of making recommendations to the committee.

The drop test procedure will be reexamined in the attempt to establish correlation between laboratories. Similar study is being made of the revolving drum test (D 782) for this purpose. A task group has been organized for the purpose of evaluating and setting up a means of standardizing evaluation of cushioning materials. The committee is interested in the statistical analysis of test data, and a task group has been studying test data from the other subcommittees and is now considering a possible manual of statistical terms and analysis.

D-12 Soaps and Other Detergents

THE committee has reactivated a program of work on methods for analysis of synthetic detergents. Also under study are the determination of moisture in dry-cleaning soaps, and additional methods for the evaluation of physical properties of surface-active agents.

A guide to laboratory metal-cleaning methods is being developed and a task group has been established to develop a classification of the soils encountered in metal cleaning.

D-14 Adhesives

IN considering strength properties, the committee has under review a new type tension test, a modification of overlap in the shear tension loading method (D 1002 T), and round-robin tests on a proposed method for rigid type plastic to plastic bonding. A proposed method of determining the nonvolatile content of urea resin adhesives is being prepared for letter ballot. Revisions in existing test methods for measuring permanence are being considered, including the procedure for measuring the effect of moisture and temperature (D 1183). Additional methods are being prepared on biological factors.

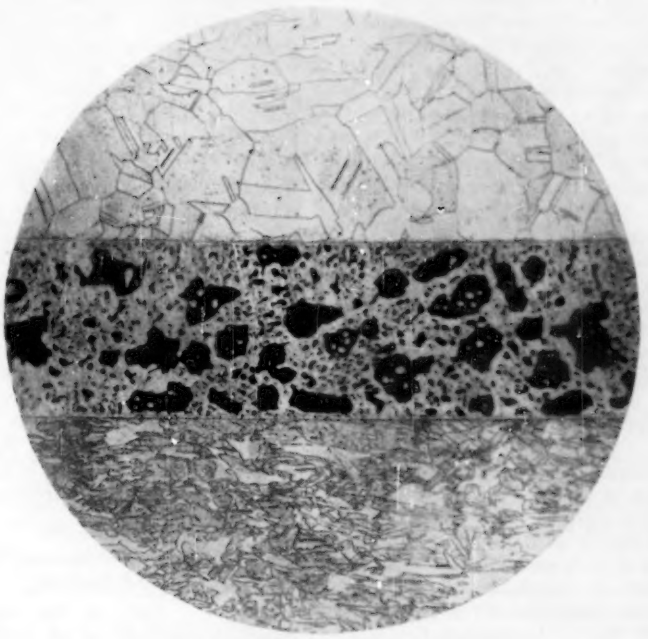
Working properties are receiving considerable attention with two new methods being prepared to measure consistency; round-robin tests are being conducted on a proposed tackmeter; and methods are being prepared to measure storage life and working life. The activity in the preparation of specifications is in the fields of adhesives for acoustical materials and for packaging. The non-destructive testing of glue lines will receive attention by the Subcommittee on Research. A proposed method for testing adhesives for electrical insulation is being studied with the intention of expanding the scope of this method.

D-18 Soils for Engineering Purposes

STANDARDIZATION activity is continuing on an extensive basis covering many phases of soil testing, including physical, chemical, structural, and dynamic properties. Definitions of terms and symbols ,which are always a necessary adjunct to test methods, are being revised in coordination with a corresponding group in ASCE. The subcommittee on sampling has been reorganized and is working on three proposed tentatives for the sampling of soils.

A procedure for measuring water permeability of compacted soils is under way. Proposed tentative methods for measuring consolidation, direct shear, and testing under triaxial loading, are in process of preparation. This is the next significant step in the field of structural properties following the presentation of symposiums on these important subjects. In the study of physical-chemical properties, a tentative method is being considered for the rapid determination of cations in soils.

In the field of special and construction control tests, intensive study will be given to several existing standards and proposed methods including the Burggraf shear test, the California Bearing Ratio test, moisture density relation of soils in the field, methods of testing soil bituminous mixtures, and a method for determining the chloride content of soils.



Soft Solder Sweat Tube Joint

Second prize, General Photomicrographs, Eighth ASTM Photographic Exhibit, by Oliver E. Olsen, National Lead Co.

Transverse section, magnification 500 ×. Composition 50 per cent solder, 50 per cent tin. The upper section is copper tube; lower is copper coupling. The bright constituent is the lead-tin eutectic. Dark rounded areas are primary lead. An interface of copper-tin is formed at the junction of the solder and copper.

D-19 Industrial Water

SEE the committee article in the July BULLETIN.

D-20 Plastics

THIS committee has just completed a year marked by an active working program in this growing segment of the materials field. In the past year approval was recorded of four new and five revised methods of test; three new and three revised specifications; and additional definitions of terms relating to plastics. Two tentative methods of test were advanced to standards and seven standards were reaffirmed.

The current working program includes six items which are ready for a committee letter ballot, as follows: new Test for Abrasion Wear; a revision of Method D 543, Test for Resistance of Plastics to Chemical Reagents; new Specifications for Polyethylene and for Dioctyl Phthalate Plasticizers; revisions in Specifications D 700, for Phenolic Molding Compounds; and new Test of Vinyl Plastics for Chlorine Content, Volatiles, and Viscosity.

The subcommittees have work under way on the following items:

Subcommittee I on Strength Properties. Tensile properties of rods, tubes, film, and sheeting; effect of clamping pressure and radius of notch on Izod impact values; a "ski-ball" impact test; tearing resistance of films; and dynamic properties of plastics.

Subcommittee II on Hardness Properties.—Evaluation of scratch hardness and a revision of the test for resistance of transparent plastics to surface abrasion.

Subcommittee III on Thermal Properties.—Determination of softening point and maximum service temperature, evaluation of SPI flammability tester, annealing of specimens for heat distortion measurements, revision of Method D 731, Test for Molding Index, to provide for measurement of molding powder behavior in high-frequency preheating, plunger molding, and large molds; also study of effects of clamping pressure and decrease in striking force at low temperatures on brittle temperature measurements by Method D 746.

Subcommittee IV on Optical Properties.—Evaluation of small color differences and development of standards for haze.

Subcommittee V on Permanence Properties.—Development of methods of test for water permeability, fungus resistance, and outdoor weathering.

Subcommittee VI on Specifications.—Revisions of specifications for methacrylate, vinyl, polyester, ethyl cellulose, and nylon molding compounds.

Subcommittee VII on Analytical Methods.—Tests for physical characteristics of vinyl plastics, and heat stability and extractability of plasticizers.

Subcommittee VIII on Research.—Application of statistical methods to results of tests on plastics, and correlation of results of empirical tests with basic properties.

Subcommittee IX on Molds and Molding.—Gating of transfer molds and mold shrinkage test method.

Subcommittee X on Definitions, Nomenclature, and Significance of Tests.—Additional definitions, correlation of terms relating to mechanical strength properties of plastics with those of Committee E-1, and revision of the code for designating form of material and direction of testing.

Subcommittee XIV on Conditioning.—Measurement and maintenance of relative humidity conditions.

The Special Committee on ISO/TC 61 of Committee D-20 has cooperated with the American Standards Assn. in organizing and assisting in the work program of this new technical committee of the International Organization for Standardization. The first meeting was held in New York in September, 1951, and was attended by representatives from Australia, France, Netherlands, Sweden, Switzerland, United Kingdom, and United States. Five working groups were set up to undertake the preparation of recommended standards for strength properties, thermal properties, chemical and physical properties, laboratory atmospheres and conditioning procedures, and equivalent terms. The next meeting of ISO/TC 61 on Plastics is scheduled to be held in Turin, Italy, October 2, 3, and 4, An American delegation of at least seven members is assured.

D-21 Wax Polishes and Related Materials

THE committee is currently interested in the development of standards for water emulsion type waxes. This work is divided into two parts, the first being the development of test methods on raw materials, and the second being concerned with chemical and physical test methods, performance tests, and specifications of products.

Test methods on raw materials are being developed for determining the hydrocarbon content in waxes, a procedure for concentrating wax, and for determining refractive index. After a review of existing ASTM standards methods, which might be adaptable for use with wax polishes, certain standards were recommended for committee use, and several new methods will be developed, including the determination of kinematic viscosity, total solids, total ash and silica, and sediment by use of a centrifuge. Round-robin tests are proceeding among ten laboratories to develop data for a performance test for measuring slip resistance. Two testing machines, the Sigler and the Underwriters, plus field tests, are involved in this research. During the year, proposed test methods will be prepared using these machines and publication as information is planned. In determining means of measuring service life or wear, it is planned to calibrate four Sward testing machines and to have tests run at the National Bureau of Standards on one source of wax.

The Subcommittee on Specifications is studying significant items that should be included in a specification and have agreed on a tentative list. Another project of this subcommittee is the preparation of a recommended practice for cleaning wax floors.

D-22 Methods of Atmospheric Sampling and Analysis

ONE of the first general standard methods to be presented will probably relate to principles of sampling. Work in this group is progressing rapidly and further action will be forthcoming at the next meeting to be held November 17 and 18. The task group on stack or collector effluent sampling has been divided into nine sections and the committee has decided to divide the work on sampling into components such as nozzles and probes, condensers, collectors, air-flow measuring devices, and air movers. Work is proceeding along these lines. In addition to the general sampling method in preparation a draft has already been prepared on miscellaneous sampling. Much work has been done toward the drafting of analytical methods for carbon monoxide determination and hydrogen sulfide. The work of the instrumentation subcommittee has been directed primarily toward a sulfur dioxide analyzer based on electrical conductivity and the use of this analyzer will probably be one of the first instrumentation standards related to air sampling and analysis.

Miscellaneous Subjects—"E" Committees

E-2 Emission Spectroscopy

SEE the committee article in the July Bulletin.

E-5 Fire Tests of Materials and Construction

BUILDING code authorities have asked Committee E-5 to include in the present Standard Methods of Fire Tests of Building Construction and Materials (E 119) fire and hose stream test methods for constructions having fire resistance ratings less than one hour. Careful study will be given this item by a subcommittee. The inclusion in E 119 of a small-scale fire test method as an appendix is still being reviewed.

Very encouraging progress has been made on the possibility of using smaller size tunnel test specimens and equipment than those specified in the Tentative Method of Fire Hazard Classification of Building Materials (E 84 T). Further tests are contemplated to obtain greater perfection in the control of draft conditions and observation of results. Efforts to define "incombustibility" are continuing. To accomplish this, it has been found necessary to develop a standard test procedure in order that the definition will have the same meaning to all users.

E-6 Methods of Testing Building Constructions

THE procedures for evaluation of the properties of panels for building construction will be correlated with the needs of other ASTM committees so that evaluations of specific materials can be made in accordance with standard procedures. Some of the studies that have been made in various research laboratories on the performance of joints between panels will be analyzed to determine if they will form a basis for joint testing equipment.

A new testing procedure for evaluation of prefabricated floor and roof constructions has been prepared and it is anticipated that it will be submitted to the Society for adoption during the coming year. Further review of durability studies has been made for the purpose of determining a standardized procedure for durability evaluation and it is evident that thermal gradient along with exposure must be considered. It is proposed that a critical bibliography of durability and exposure studies be prepared, and it is contemplated that work will be done on that project this year.

The methods of fire testing for evaluation of properties of materials will be correlated with other committees and the need for a $^3/_4$-hr fire endurance test followed by a hose stream test will be further investigated, and an effort will be made to develop the appropriate standard if needed, in cooperation with Committee E-5 on Fire Tests. Correlation of fire testing of drapery materials and hangings will be carried out with appropriate committees. Plans for a symposium on building research are to be developed.

E-9 Fatigue

THE list of abstracts of Articles on Fatigue published in 1950 was well received and a new list is currently being prepared which will be compiled of abstracts of those papers in the fatigue field which were published in 1951. It is proposed to continue a reference service of this general type.

In 1950 a survey of existing projects on fatigue was made and the results published as an appendix to the annual report. This year a similar survey is being made and it is planned again to publish the results.

Interest in fatigue tests of large size members has continued and a subcommittee is considering ways and means of sponsoring a program of bending and torsion and fatigue tests of large members.

E-10 Radioactive Isotopes

ONE of the several important functions of the committee is to advise other ASTM technical committees on the preparation of methods and the development of instruments in the field of radioactive isotopes. The committee felt that it would be well to check with each of the other committees in fields where these special techniques might have desirable applications.

Just previous to the annual meeting a circular letter was distributed to all ASTM committee officers asking for their opinion on the ASTM testing methods under their jurisdiction which might most likely be improved by the application of radioactive tracer technique. This preliminary judgment will be used by an E-10 subcommittee as a starting point.

Plans are underway for a symposium at the 1953 Annual Meeting in Atlantic City, which will include papers, films, and a panel discussion. It is hoped that demonstration equipment can be used in conjunction with the symposium.

E-11 Quality Control of Materials

THIS committee has six Task Groups actively working on sections of the ASTM Manual on Quality Control of Materials or new recommended practices. The subjects under development are as follows:

1. Review of ASTM sampling plans.
2. Planning of interlaboratory test programs.
3. Number of tests for a desired precision of an average.
4. Sampling of bulk materials.
5. The fitting of straight lines (smoothing empirical data).
6. Use of precision, accuracy, and other related terms.

The projects on planning interlaboratory test programs and number of tests for a desired precision are nearing completion and it is hoped that they will be available for publication in 1953.

The ASTM Manual on Quality Control of Materials, published in January, 1951, continues to be in constant demand. The first two printings of the Manual have been exhausted and a third printing is now on press.

Joint Committee on Effect of Temperature on the Properties of Metals

WHILE this Joint Committee has largely concentrated its work in the field of research, including many sponsored projects at leading research institutions, and the development of technical papers and symposiums, it does have certain standard test methods in its charge, and other activities in this latter field are under way. The work is coordinated among the various panels by a separate group on test methods. A recommendation from this panel now being approved, concerns the time for rupture test E 85 whereby maximum variations up to certain temperatures are being tightened. Other changes are being contemplated.

The title and scope of the Recommended Practice for Long-Time High-Temperature Tension Tests (E 22) is to be modified to include the phrase "Constant-Load Tension Creep Tests." Other changes are being studied. The committee will attempt to develop standard definitions of the terms "creep" and "stress rupture." A combined "creep rupture" recommended practice is to be drafted and also standardized procedures for the use of V-notch tension specimens.

Future work which the committee may be called upon to undertake would include standard practices for determining thermal shock, constant strain rate, high-temperature fatigue, and deformation cycle tests.

Technical Papers Published

IT IS planned to include in each issue of the ASTM BULLETIN a list of the technical papers which have recently appeared, either as part of new Special Technical Publications (STP's) or as individual reprints.

For the most part, copies of these papers will be available in separate pamphlet form at a nominal charge of 25 cents each.

These lists, one of which appears below, will be comprised largely of papers in STP's. Where individual papers are included that are to appear in the *Proceedings* a note will so indicate.

Symposium on Acoustical Materials

Brief History of the Acoustical Materials Industry—Wallace Waterfall
The Measurement of Sound Absorption—Hale J. Sabine
Combustibility of Acoustical Materials—Wallace Waterfall
Maintenance of Acoustical Materials—Peter Chrzanowski and Albert London
The Erection of Acoustical Tile—L. F. Yerges
Basic Physical Properties of Acoustical Materials—William Jack

Symposium on Measurement of Consumer Wants

Determination of Soldier-Wants—W. C. Schaefer
Determination of Soldiers' Food Wants—R. P. Benedict
The General Problem of Measurement—S. A. Stouffer
Interview Bias—C. W. Hart
Same Applications of the Panel Method to the Study of Social Change—C. Y. Glock
Effective Sampling Procedures for Use in Measuring Consumer Wants—F. F. Stephan and P. J. McCarthy

Symposium on Consolidation Testing of Soils

Report of Consolidation Tests With Peat—James B. Thompson and L. A. Palmer
Consolidation and Related Properties of Loessial Soils—W. G. Holtz and H. J. Gibbs
Settlement of a Railroad Embankment Crossing the Morganza Floodway, Louisiana—W. G. Shockley and C. I. Mansur
Aids in the Interpretation of the Consolidation Test—Hudson Matlock and Raymond F. Dawson
A Rapid Technique of Consolidation Testing—R. H. Karol
The Effect of Temperature on the Consolidation Characteristics of Remolded Clay—F. N. Finn
Observed Settlements of Highway Structures Due to Consolidation of Alluvial Clay—E. S. Barber
The Application of Controlled Test Methods in Consolidation Testing—Donald M. Burmister

Symposium on Surface and Subsurface Reconnaissance

Interpreting Geologic Maps for Engineers—E. B. Eckel
Engineering Implications of Geological Reconnaissance in the Plains Area—Missouri River Basin—E. A. Abdun-Nur and J. D. Dowling
Preliminary Foundation Exploration in Arctic Regions—L. A. Nees and A. M. Johnson
Preparation of County Engineering Soil Maps for Illinois—T. H. Thornburn
The Engineer Looks at Pedology—R. L. Greenman
Application of Aerial Photographs to Preliminary Engineering Soil Surveys—R. D. Miles
The Preparation of an Engineering Soil Map of New Jersey—D. R. Lueder
Earth-Resistivity Tests Applied to Subsurface Reconnaissance Surveys—R. W. Moore
Electrical Resistivity Geophysical Method as Applied to Engineering Problems—H. LeRoy Scharon
Geophysical Measurements of the Depth of Weathered Mantle Rock—D. Wantland
The Practical Value of an Earth Resistivity Method in Making Subsurface Explorations—W. F. Abercrombie
Application of Seismic Methods to Foundation Exploration—A. M. Johnson and R. H. Wesley
Experience With Geophysics in New York State—P. H. Bird
Seismology Applied to Shallow Zone Research—D. Linehan
Resistivity Reconnaissance—I. Roman

Important New Publications in Soils: Consolidation Testing; Surface and Subsurface Reconnaissance

Books of Interest in Many Fields

THE May issue of the BULLETIN carried an announcement of a special combination price for a group of five publications issued by the Society in the soils field. Included in the group were the *Symposium on Consolidation Testing of Soils, STP 126,* and *Symposium on Surface and Subsurface Reconnaissance, STP 122,* which are now available and will be shipped to all who have previously ordered the whole group, and to those who now wish to purchase them separately or in combination.

Consolidation Testing:

The threefold purpose of this Symposium as outlined in the Introduction is to illustrate the wide range, variety, and character of consolidation problems; to present the various approaches and the consolidation testing techniques employed in the analyses of these problems; and to advance the knowledge of the nature of consolidation phenomena.

To accomplish this purpose, the authors of the papers, well qualified by long experience in the field, report on consolidation tests with peat; consolidation and related properties of loess soils; settlement of the railroad embankment crossing of the Morganza Floodway, Louisiana; aids in the interpretation of the consolidation test; a rapid technique of consolidation testing; the effect of temperature on the consolidation characteristics of remolded clay; observed settlement due to consolidation of alluvial clay; the application of controlled test methods in consolidation testing.

Bound in heavy paper cover, this 100-page book can be obtained from ASTM Headquarters for $1.75; for members, $1.35.

Surface and Subsurface Reconnaissance:

This Symposium was organized by Subcommittee R-1 on Surface and Subsurface Reconnaissance of ASTM Committee D-18 on Soils for Engineering Purposes, as a step toward the development of data defining the limitations as well as the useful applications of the various reconnaissance methods. Rapid development in the field had created some erroneous assumptions with respect to their applicability and indicated lack of knowledge of degree of accuracy.

The fifteen papers prepared to meet this need covered: interpretation of geologic maps; reconnaissance in the plains area; foundation exploration in the arctic; preparing county soil maps; the engineer and pedology; aerial photographs and preliminary soils surveys; soil map for New Jersey; a critical review of air photo analysis; earth resistivity tests; electrical resistivity method; measurements of weathered mantle rock; earth resistivity method in subsurface explorations; seismic methods and foundation exploration; seismology applied to shallow zone research; resistivity reconnaissance.

Totaling 225 pages, bound in heavy paper cover, this book can be obtained from Headquarters for $3; $2.25 to members.

If these Symposiums are purchased in combination with three other ASTM publications on soil mechanics, namely:

Soil Testing Procedures
Identification and Classification of Soils
Triaxial Testing of Soils and Bituminous Mixtures

the price for all five publications is $9.75; to members $8.35.

Symposium on Consumer Wants Measurement Now Available

RECOGNITION by ASTM that it might be concerned with various phases of the problem of ultimate consumer goods, resulted in the organization of an Administrative Committee on Ultimate Consumer Goods. This committee was responsible for the development of this Symposium as covering a subject of fundamental interest.

The engineer's problem of devising tests for consumer goods can be greatly simplified if he has a clear knowledge of what the consumer prefers in the end product. With the desired properties determined, he can then perform a more precise test.

It was the purpose of this group of papers to acquaint the engineer with the scientific advancement in the methods of determining and measuring wants. Techniques of measurement are described and evaluated in the six papers which, along with introductory material and general discussion, comprise the Symposium. These include: determination of soldier-wants; the general problem of measurement; interview bias; applications of the panel method to the study of social change; and effective sampling procedures.

Copies of this Special Technical Publication, No. 117, can be obtained from the Society, 1916 Race St., Philadelphia, Pa., at a list price of $1.50; the price to members is $1.15.

Symposium on Acoustical Materials

IN A society exercising ever widening modification and control of environmental factors, the reduction or elimination of noise becomes increasingly important. While this is being accomplished most effectively by use of acoustical materials which are being employed extensively, very few test methods have been established and accepted for determining the properties of these materials.

Spanning the varied fields of sound absorption, combustibility, cleanability, painting, application, light reflection, and strength, numerous problems confront the recently organized ASTM Committee C-20 on Acoustical Materials. This Symposium was developed by the committee to discuss the origin and history of the group itself and to outline some of the many and varied technical questions it is attempting to solve.

Following an introduction by Committee Chairman H. A. Leedy, Director of Armour Research Foundation, the papers and authors included in the Symposium are:

Brief History of the Acoustical Materials Industry, by Wallace Waterfall, Executive Secretary, Acoustical Materials Association
The Measurement of Sound Absorption, by Hale J. Sabine, Celotex Corp.
Combustibility of Acoustical Materials, by Wallace Waterfall
Maintenance of Acoustical Materials, by Peter Chrzanowski and Albert London, National Bureau of Standards
The Erection of Acoustical Tile, by L. F. Yerges, United States Gypsum Co.

This book, just off press, can be purchased from Society Headquarters at a list price of $1; 75¢ to members.

Needed: Part 2, Non-Ferrous Metals, 1949 Book or Standards

A CONTINUED heavy demand for Part 2, Non-Ferrous Metals, of the 1949 Book of Standards has virtually exhausted the edition. Since a number of the members may be willing to dispose of their copies so that the Society can fill some of the urgent orders, this article urges those who feel that they can do without their book for a few months pending the new 1952 edition to send them back to Headquarters. The Society will buy back copies of this Part at $4 each, it being assumed the book would be in reasonable condition for resale.

A similar plea for copies of Part 1, Ferrous Metals, 1949 Book of Standards, was made several months ago and the helpful cooperation of many members enabled us to fill a number of urgent needs. The demand for this Part, too, continues and copies will likewise be purchased at $4 each. In returning either Part 1 or Part 2, be sure the return address is on the package to enable identification. It is well, also, to advise that shipment is being made.

(1950 and 1951 Supplements are not needed.)

LIST OF FORTHCOMING ASTM PUBLICATIONS

REGULAR PUBLICATIONS

1952 Book of Standards:

Part 1—Ferrous Metals
Part 2—Non-Ferrous Metals
Part 3—Cementitious, Soils, Road and Waterproofing Materials
Part 4—Paint, Paint Materials, Naval Stores, Wood
Part 5—Fuels, Petroleum, Aromatic Hydrocarbons
Part 6—Electrical Insulation, Plastics, Rubber
Part 7—Textiles, Water, Soaps, Paper, Shipping Containers, Adhesives

1952 Proceedings
1952 Index to ASTM Standards
1952 Year Book

COMPILATIONS

Steel Piping Materials (A-1)
Metallic Electrical Conductors (B-1)
Electrical Heating, Resistance, and Related Alloys (B-4)
Copper and Copper Alloys (B-5)
Light Metals and Alloys (B-7)
Electrodeposited Metallic Coatings (B-8)
Mineral Aggregates, Concrete, and Nonbituminous Highway Materials (C-9, D-4)
Paint, Varnish, Lacquer and Related Products (D-1)
Petroleum Products and Lubricants (D-2)
Gaseous Fuels (D-3)
Bituminous Materials for Highway Construction, Waterproofing, and Roofing (D-4, D-8)
Coal and Coke (D-5)
Paper and Paper Products (D-6)
Electrical Insulating Materials (D-9)
Rubber Products (D-11)
Soaps and Other Detergents (D-12)
Textiles Materials (D-13)
Adhesives (D-14)
Industrial Waters (D-19)
Plastics (D-20)

SPECIAL PUBLICATIONS

Engine Antifreezes
ASTM-IP Oil Measurement Tables
Engine Test Methods for Rating Fuels
Procedure for Emission Spectrochemical Analysis
Metal Cleaning Bibliography
Bibliography on Electrical Contacts
Index to Literature on Spectrochemical Analysis
Articles on Fatigue
Sampling of Petroleum Products
Manual on Water
50 Year Index to Papers and Reports

SYMPOSIUMS AND LECTURES

Gillett Lecture
Marburg Lecture
Symposium on Tin
Symposium on Fretting Corrosion
Symposium on Recent Development in the Evaluation of Natural Rubber
Symposium on Testing Adhesives for Durability and Permanence
Symposium on Exchange Phenomena in Soils
Symposium on Direct Shear Testing of Soils
Symposium on Continuous Analysis of Industrial Water and Industrial Waste Water
Symposium on Plastics
Symposium on Conditioning and Weathering
Symposium on Determination of Elastic Constants
Symposium on Light Microscopy
Symposium on Effects of Notches and Metallurgical Changes on Strength and Ductility of Metals at Elevated Temperatures
Symposium on Paint
Symposium on Electron Microscopy
Symposium on Fatigue, with Emphasis on Statistical Approach
Symposium on Interpretation of Non-Destructive Tests
Symposium on Metal Powders and Metal Powder Products
Symposium on Insulating Oil
Symposium on Statistical Methods for the Detergent Laboratory
Symposium on Measurement of Consumer Wants
Symposium on Surface and Subsurface Reconnaissance
Symposium on Acoustical Materials
Symposium on Consolidation Testing of Soils
Symposium on Color Differences

New Edition of Electrical Conductors Compilation

Now available and of interest to all producers and consumers in the field is the second edition of "Metallic Electric Conductors," sponsored by ASTM Committee B-1 on Wires for Electrical Conductors. Containing 48 standards and specifications this compilation presents in convenient reference form specifications pertaining to metallic electric conductors for use in uninsulated or uncovered form or for subsequent use in making insulated or covered conductors.

All specifications under the jurisdiction of Committee B-1 are given, including those for hard-drawn copper wire and rope-lay-stranded copper conductors. In addition there are the copper bus bar and tube specifications under the jurisdiction of Committee B-5 on Copper and Copper Alloys; and aluminum bus bar specifications under the jurisdiction of Committee B-7 on Light Metals and Alloys.

Selected specifications prepared by Committee B-2 on Non-Ferrous Metals and Alloys covering the primary forms of copper, zinc, and lead used in the manufacture of conductors covered by the specifications of Committee B-1 have been added. Also included are tests and specifications on galvanized iron and steel guy wires, messenger wires, span wires, overhead ground wires, etc., prepared by Committee A-5 on Corrosion of Iron and Steel.

Copies of this 250-page compilation in heavy paper cover can be obtained from ASTM Headquarters at a list price of $3. The price to members is $2.25.

Third Printing of Quality Control Manual

WITH the stock of the ASTM Manual on Quality Control of Materials getting low, it has been necessary to proceed with the third printing of this widely distributed book. Prepared by ASTM Committee E-11 on Quality Control as an extended revision of the former Manual on Presentation of Data, it comprises three parts as follows: Part 1—Presentation of Data; Part 2—Presenting ± Limits of Uncertainty of an Observed Average; Part 3—Control Chart Method of Analysis and Presentation of Data.

Not only does the Society's work, in arriving at standards of quality and methods of testing that are accurate and satisfactory, require the collection, analysis, interpretation and presenta-

tion of quantitative data, but in almost every phase of industry this same sequence is required as a continuing operation. This is one of the reasons for the intense interest in this valuable Manual. As published, the Manual has been endorsed by the American Society for Quality Control, and this group also handles the publication on a sales basis to its members.

Copies of the Manual, 142 pages, January, 1951, can be procured at a list price of $1.75; to ASTM and ASQC members, $1.35.

1952 ASTM Year Book

THE 1952 Year Book of the Society will soon be distributed to members who have requested a copy.

A comprehensive reference book of ASTM personnel and fields of activity, the 600-page book contains an alphabetic list of members with addresses, titles, and company affiliations of each individual, and, in the case of company memberships, the name of the company representative.

Approximately half the book is devoted to a listing of committee personnel. This section lists all technical committees and other committees, their officers, and the complete personnel of the main committees and subgroups.

Other portions of the Year Book are devoted to the By-laws and Charter of the ASTM, its regulations, lists of award winners, information on various administrative committees, and District Councils. Also bound into each copy are membership application blanks for ready availability to members when a new membership is in prospect.

This book is distributed to members on request and many have asked that they be included on the permanent mailing list. A copy is given to each new member who also has the privilege of having his name placed on the permanent mailing list.

The Year Book will not be available for general distribution; it is published only for use of the members in connection with the activities of the Society.

Mellon Institute Standardization Research

A FELLOWSHIP for conducting systematic studies of standardization and its application in science, engineering, production, and marketing has been announced by Edward R. Weidlein, President of the Mellon Institute in Pittsburgh, Pa. This Fellowship will be sustained at the Institute by a grant from the Sarah Mellon Scaife Foundation of Pittsburgh, and its projects will be organized and supervised by Dickson Reck, Advisory Fellow. Dr. Reck will work in cooperation with research specialists of the Institute and with national authorities and societies.

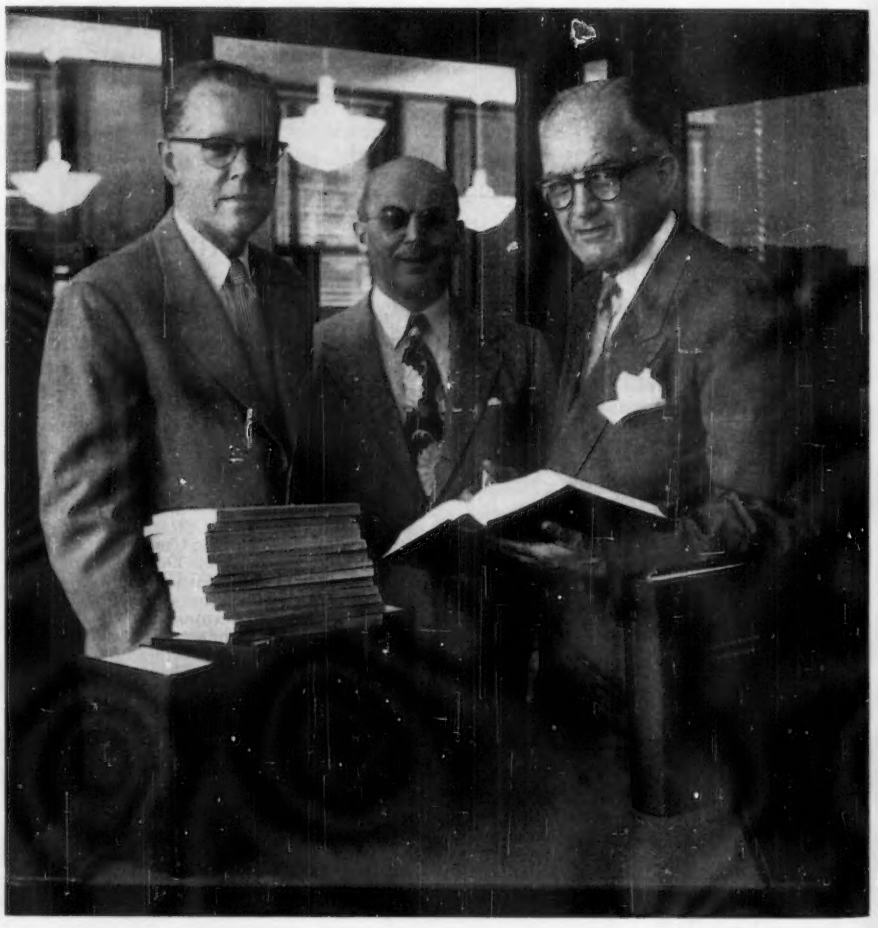
Antifreeze Publication Valuable to Consumers

OF INTEREST to everyone who owns an automobile, and especially with winter in the offing, is a valuable little publication just off press, on "Selection and Use of Engine Antifreezes."

Prepared by ASTM Committee D-15 on Engine Antifreezes, the purpose of this report, as stated in the Introduction, is "to provide consumers with practical information and advice on engine cooling system antifreezes and corrosion inhibitors." Also discussed are the related cooling system products such as cleaning compounds and stop-leaks.

Since general cooling system maintenance information has been widely published, this discussion is confined to those practices directly concerning antifreeze. Among the topics covered are installation, servicing, and reuse of antifreeze; testing and mixing of various types of solutions; and cleaning of the system.

Copies of the pamphlet, which is amply illustrated, can be purchased from ASTM Headquarters, 1916 Race St., Philadelphia, Pa., for 40¢.



Numerous house organs issued by company members of the Society complimented ASTM and paid tribute to its work with articles referring to our 50th Anniversary and the New York meeting. Clippings of a number of these are in our files and were shown to the ASTM Committee on Developmental Activities, the Board of Directors at its meeting in September. Some included illustrations, one of these being the June *Synchroscope* of The Detroit Edison Co. We reproduce the photograph here which shows three men very active in the Society. Left, Harvey A. Wagner, Assistant Chief Engineer, Engineering Dept., very active in Committee A-1 on Steel, and other committees; center, L. J. Jacobi, Inspection and Standards Engineer, who serves on ASTM Committees D-7 on Wood and B-1 on Wires for Electrical Conductors, and makes widespread use of ASTM standards in the Detroit Edison purchasing specifications; and right, C. H. Fellows, Director, Engineering Laboratory and Research Dept., formerly an ASTM Director, who serves on many ASTM groups including D-9 on Electrical Insulating Materials, D-19 on Industrial Water, and others, and who has had a very active part in district activities, having been chairman of the Administrative Committee on District Activities and chairman of our Membership Committee. Of course we are not only interested in the pleasant expressions of these hardworking ASTM members, but the fact that these come to us over an impressive assemblage of books in which we are more than slightly concerned, namely, the Book of ASTM Standards. The Detroit Edison book is on the right.

Personnel of Board of Directors and Committees

SUBSEQUENT to the June election of five new members to the Board of Directors of the Society, the Executive Committee of the Board and the other Board Committees provided for under the By-laws, were reorganized.

The personnel of the new Executive Committee which will function during 1952–1953, and of the other six subcommittees is listed below.

ASTM BOARD OF DIRECTORS

President:

H. L. MAXWELL, Section Supervisor, Mechanical Engineering Consultants, E. I. du Pont de Nemours and Co., Inc., 11494 Nemours Building, Wilmington 98, Del.

Vice-Presidents:

L. C. BEARD, JR., Assistant Director, Socony-Vacuum Labs., Socony-Vacuum Oil Co., Inc., 26 Broadway, New York 4, N. Y.

N. L. MOCHEL, Manager, Metallurgical Engineering, Westinghouse Electric Corp., Lester Branch Post Office, Philadelphia 13, Pa.

Directors:

(Term Expiring in 1953)

B. A. ANDERTON, Consultant, Research and Development Dept., Barrett Div., Allied Chemical & Dye Corp., Research Laboratory, Edgewater, N. J.

R. H. BROWN, Executive Engineer, Parks-Cramer Co., Fitchburg, Mass.

D. K. CRAMPTON, Director of Research, Chase Brass and Copper Co., Inc. Waterbury 2, Conn.

H. G. MILLER, 1933 S. Eighty-second St., West Allis 14, Wis.

J. R. TRIMBLE, Manager, Department of Metallurgy, Inspection and Research, Tennessee Coal and Iron Div., United States Steel Co., Box 599, Fairfield, Ala.

(Term Expiring in 1954)

J. W. BOLTON, Director of Metallurgical Research and Testing, The Lunkenheimer Co., Beekman and Waverly Sts., Cincinnati 14, Ohio.

R. A. SCHATZEL, Vice-President and Director of Engineering, Rome Cable Corp., 330 Ridge St., Rome, N. Y.

E. O. SLATER, President and Manager, Smith-Emery Co., 920 Santee St., Los Angeles 15, Calif.

STANTON WALKER, Director of Engineering, National Sand and Gravel Assn., 1325 E St., N. W., Washington 4, D. C.

F. P. ZIMMERLI, Chief Engineer, Barnes-Gibson-Raymond, Division of Associated Spring Corp., Box 555, Plymouth, Mich.

(Term Expiring in 1955)

G. R. GOHN, Supervisor, Creep and Fatigue Labs., Bell Telephone Laboratories, Inc., 463 West St., New York 14, N. Y.

W. H. LUTZ, Technical Director, Pratt & Lambert, Inc., 79 Tonawanda St., Buffalo 7, N. Y.

H. K. NASON, Research Director, Organic Chemicals Div., Monsanto Chemical Co., 1700 S. 2d St., St. Louis 4, Mo.

A. O. SCHAEFER, Vice-President in Charge of Engineering and Manufacturing, The Midvale Co., Nicetown, Philadelphia 40, Pa.

M. A. SWAYZE, Director of Research, Lone Star Cement Corp., Fifteenth Floor, 100 Park Ave., New York 17, N. Y.

Past-Presidents:

J. G. MORROW, Metallurgical Engineer, The Steel Company of Canada, Ltd., Hamilton, Ont., Canada.

L. J. MARKWARDT, Assistant Director, U. S. Forest Products Laboratory, Madison 5, Wis.

T. S. FULLER, Engineer in Charge of Works Laboratory, General Electric Co., Schenectady 5, N. Y.

COMMITTEES OF BOARD OF DIRECTORS
1952–1953

Executive Committee

L. C. Beard, Jr., *Chairman*
T. S. Fuller — H. K. Nason
H. L. Maxwell — J. R. Trimble
Stanton Walker

Finance Committee

J. G. Morrow, *Chairman*
L. C. Beard, Jr. — L. J. Markwardt
T. S. Fuller — R. A. Schatzel

Membership Committee

E. O. Slater, *Chairman*
J. W. Bolton — W. H. Lutz
D. K. Crampton — M. A. Swayze

Meetings and Programs

R. H. Brown, *Chairman*
G. R. Gohn — M. A. Swayze
H. G. Miller — F. P. Zimmerli

Technical Committee Activities

Stanton Walker, *Chairman*
R. H. Brown — H. G. Miller
W. H. Lutz — H. K. Nason

Inter-Society Relations

N. L. Mochel, *Chairman*
B. A. Anderton — E. O. Slater
A. O. Schaefer — F. P. Zimmerli

Developmental Activities

J. R. Trimble, *Chairman*
B. A. Anderton — G. R. Gohn
J. W. Bolton — R. A. Schatzel

President Maxwell is an *ex-officio* member of all Board Committees.

Newly Designed Certificates of Membership

A NEWLY designed Certificate of Membership is now being prepared under the auspices of the Membership Committee. This is smaller in size than the one that has been used for many years, and is a somewhat more modern design. The new size is 12 by 9½ in. The accompanying illustration shows a facsimile of the new certificate, about one-third full size. On the certificate, for which an excellent grade of heavy parchment paper is used, is engrossed the member's name, date of membership, and the classification. This certificate is personally signed by the President and the Secretary, after which the official Society seal is affixed.

Members who wish these certificates can procure them from ASTM Headquarters at a cost of $3.75.

American Society for Testing Materials

ORGANIZED 1898 — INCORPORATED 1902

This is to Certify that

William Simpson Reynolds

on December fifteenth, 1950 was Elected a Member of the

American Society for Testing Materials

A Corporation formed for the Promotion of Knowledge of Materials of Engineering and the Standardization of Specifications and Methods of Testing

Witness our hand and seal at Philadelphia, this twenty-seventh day of December 1952

President

Secretary

SEAL

ASTM Bulletin

SEPTEMBER 1952

NO. 184

NINETEEN-SIXTEEN
RACE STREET
PHILADELPHIA 3, PENNA.

A Bird's-Eye View—Impressive

THE amount of work going on in many different fields, makes it difficult to get an over-all picture of the amount of standardization and research work under way in ASTM technical committees. However, every year the September BULLETIN carries an article noting the high spots of important standardization work in progress. This article begins on page 5 of this BULLETIN. The material is subdivided in accordance with the respective fields and appears in the order of committee designations—A, B, C, D, and E. This arrangement makes it convenient for those concerned with specific materials quickly to ascertain some of the standards projects that are in process.

This article is based on statements from committee officers, in part on 1952 preprinted reports, and is supplemented by the Staff men who follow the various groups.

Even though the article is lengthy, it is still not altogether complete, since for various reasons notes on some committees have not been included. Some of these will appear in later BULLETINS.

Yet, the over-all picture is impressive, and discounting the projects which will entail revisions of existing standards, both specifications and tests (in itself new work) there are dozens of new standards in prospect covering new materials or new tests to evaluate important properties of materials. These are aimed to provide standards of quality which eventually will find national and international use.

This imposing and impressive article really carries its own message. It is indicative of an advancing organization based on cooperative effort—in fact, the article itself is made possible only as a cooperative effort.

Standards Increase in Use—Cotton Yarn Boards an Outstanding Example

AT ONE time the Staff attempted to maintain a card record showing the use of ASTM standards. This included notes on various building codes that incorporated the specifications and tests; it noted textbooks in which the standards were published; it referred to correspondence involving orders for standards where we knew they were to be embodied in large construction jobs; and other similar cases. Unfortunately, the project had to be curtailed somewhat although there are still some records maintained.

One evidence of the use of standards is their distribution, and that brings us to the Cotton Yarn Appearance Standards which were taken over by ASTM some years ago at the request of the Government department that had been handling them. These standards constitute a photographic record of grades of cotton yarns. Twenty 5½ by 10-in. photographs represent each of the five groups of yarn numbers with each group mounted on a heavy board. At first the demand for the boards was rather limited; then it began to grow, and last year word seemed to spread rapidly and those responsible for production of the board, have been hard put to keep up with the demand. At the moment there is particularly heavy demand from abroad.

To insure that the photographs shall be of the desired quality, a special group in Committee D-13 on Textile Materials has devoted many hours on different occasions in reviewing and passing upon the hundreds of photographs required. Like so many of the ASTM committee people whose intensive and long-time efforts frequently are not heralded world-widely, although always the committee associates and usually the Staff know well of the work and its excellent results, this group has not been widely publicized. We have acknowledged their efforts and no doubt they and their Committee D-13 associates are getting much gratification from the wide demand and increasing use of these photographic charts which are part of the Yarn Standards D 180. We should like to record the names of these men whose excellent work continues: John M. Cook, U. S. Department of Agriculture, Clemson, S. C.; Frank J. O'Neil, Pacific Mills, Lawrence, Mass.; S. T. Burley, Jr., U. S. Department of Agriculture, Washington, D. C.; G. K. Lake, Burlington Mills Corp., New York, N. Y.; W. Blake Lane, West Point Manufacturing Co., Shawmut, Ala.

BULLETIN Make-up Change

A SLIGHT change in BULLETIN format is planned for our October issue. Since the change involves shifting the positions of certain regular BULLETIN features it may be of interest.

It has been our practice to position four pages of advertising in the front and the remainder at the rear. The pages in the back have been unbroken by any kind of editorial matter. It is now our plan, beginning with the October issue, to include certain selected groupings of editorial matter in the back of the book along with advertising pages. Departments tentatively scheduled for inclusion in the back are: "News Notes on Laboratory Supplies and Testing Equipment," "Personals," "Necrology," "Book Reviews," etc. The pages devoted to technical papers (given STP numbers, as well as page numbers) will not be affected by the change. In the new make-up, considerable care will be taken to avoid a "tricky" or otherwise cumbersome make-up.

Though the plan is primarily designed to improve the BULLETIN's advertising position, it is our hope that the more varied and less formal arrangement of editorial and advertising pages will be pleasing in itself.

Members to Act on Standards Submitted by Letter Vote

During early September a letter ballot was submitted for approval on proposals from the technical committees on standards and tentatives. These proposals fall into two categories, namely, the adoption of tentative specifications and tests as formal standards, and the adoption of revisions in existing standards.

The letter ballot on the actions will be canvassed on September 30.

The Board of Directors considers it most desirable that all members in good standing should record their votes on all matters upon which they feel technically qualified to vote, and to refrain from voting on other matters. Three columns have been provided on the ballot for "affirmative," "negative," and "not voting" record.

In connection with the actions on standards, it should be noted that only by letter ballot of the entire Society membership can changes be made in the *formal* standards. Action taken in an annual meeting session alone, or in the interval between annual meetings, by the Administrative Committee on Standards (1) can approve for publication as *tentative* proposed new standards, (2) can approve *revisions in tentative standards* (which are incorporated immediately), or (3) can take action to permit publication of *proposed revisions in standards as tentative*.

Detailed information concerning matters referred to letter ballot is given in the committee reports issued in preprint form to the membership in advance of the meeting. The Summary of Proceedings which accompanied the letter ballot contains a record of all actions taken at the Annual Meeting.

All newly adopted and revised standards will be published in the 1952 7-part Book of ASTM Standards, the first volume of which will appear late this year.

Notice

Our attention has been called to an inadvertent omission of an item in the 1952 Letter Ballot on Recommendations Affecting ASTM Standards. In order to present this item to the membership of the Society the following special letter ballot is included in this issue of the ASTM Bulletin. All members are urged to complete this ballot, detach, and return it to ASTM Headquarter by Oct. 15, 1952.

ASTM
1916 Race Street
Philadelphia 3, Pa.

1952 Letter Ballot

Adoption of Tentatives as Standard

Building Constructions

		Affirmative	Negative	Not Voting
222.	Methods of Testing Truss Assemblies (E 73 – 48 T), as revised.			

(Signed)_____
Member, ASTM

Date_____

Schedule of ASTM Meetings

This gives the latest information available at ASTM Headquarters. Direct mail notices of all district and committee meetings customarily distributed by the officers of the respective groups should be the final source of information on dates and locations of meetings. This schedule does not attempt to list all meetings of smaller sections and subgroups.

Date	Group	Place
September 28–October 2	D-2 on Petroleum Products and Lubricants	Chicago, Ill.
October 2–3	C-19 on Structural Sandwich Construction	Boston, Mass.
October 8	Pittsburgh District	Pittsburgh, Pa.
October 9	Philadelphia District	Philadelphia, Pa.
October 15–17	D-13 on Textile Materials	New York, N. Y.
October 16–17	D-10 on Shipping Containers	Chicago, Ill.
October 16–17	D-15 on Engine Antifreezes	New York, N. Y.
October 27–29	C-16 on Thermal Insulating Materials	Hot Springs, Va.
October 27–29	D-20 on Plastics	Boston, Mass.
October 28–29	C-9 on Concrete and Concrete Aggregates	Philadelphia, Pa.
October 28	New England District	Boston, Mass.
October 29	C-17 on Abestos-Cement Products	Philadelphia, Pa.
October 29–31	D-9 on Electrical Insulating Materials	Boston, Mass.
October 30	St. Louis District	St. Louis, Mo.
October 30–31	C-1 on Cement (50th Anniversary)	Philadelphia, Pa.
November 18	Southern California District	Los Angeles, Calif.
November 25	Northern California District	San Francisco, Calif.
November 25	E-11 on Quality Control of Materials	Philadelphia, Pa.
1953		
January 26–28	D-19 on Industrial Water	St. Louis, Mo.
February 3–5	A-1 on Steel	Birmingham, Ala.
February 13	Philadelphia District (National Officer's Night)	Philadelphia, Pa.
March 2–6	ASTM Spring Meeting and Committee Week	Detroit, Mich.
June 29–July 3	ASTM Annual Meeting	Atlantic City, N. J.

Members Across the Sea

The growing number of foreign members, which will be made obvious when the new Year Book is published, is indicative of the interest in materials and at the same time the value with which those abroad concerned with technical matters view the ASTM publications and the other assets of membership.

Recently in reviewing a small batch of membership blanks (periodically crossing our desk) we noticed, for example, new members from Italy, Venezuela, South Africa, and Chile.

We would not presume that membership in the Society would act in any way as a leveler of barriers or that necessarily it would tend to stabilize our contacts with our friends abroad and serve as a medium of world peace. On the other hand, the many friendly contacts developed by the Society through its memberships abroad, and by the many visits to our office by our foreign friends presumably do not set up any areas of friction—probably quite the contrary.

Chemical Developments and Engineering Materials

PRESIDENT HAROLD L. MAXWELL has prepared a special paper for presentation at various ASTM District sessions. This will be varied somewhat depending on the length of the program desired and the particular locality. A short statement on this talk follows:

Based on his long experience in the chemical industry, Dr. Maxwell will present some of the interesting aspects of materials problems encountered in putting new chemical processes into producing plants. He and his large group of consultants and engineers, employing both metals and nonmetallic materials, have met with diverse experiences in the selection of engineering materials to withstand process conditions of stress and corrosion. The chemical industry as a whole is based on research. The process of adaptation of the fruits of research into modern chemical plants is a field in which materials standards and, in particular, standard testing methods have made a significant contribution. Standards have helped make possible the plant scale production of such man-made miracles as nylon, Orlon, and Dacron and have served as dependable guides in continuing the advance of the chemical industry, and thereby assuring many of the comforts and conveniences of modern living.

ASTM Specifications Translated into French

WE ARE always intrigued in noting how our specifications appear when they are translated into a foreign language. Frequently, depending on the language, they may be more tersely expressed, or the opposite may be the case. We reproduce below the title and the introductory note appearing in the translation into French of the Nodular Iron Castings Specifications, A 339. These were recently included in a brochure issued by the French associates of International Nickel Co.

Spécifications Provisoires Pour Les Moulages En Fonte A Graphite Sphéroidal
ASTM Designation: A 339 – 51 T
Publée en 1951

Ces spécifications provisoires ont été approuvées par le Comité responsable et acceptées par la Société conformément à la procédure établie, pour être utilisées en attendant l'adoption comme normes. Les suggestions en vue de révisions doivent etre addressées à la Société à 1916, Race St. Philadelphia 3, Pa.

ASTM Districts Plan Fall and Winter Activities

Meetings Scheduled for Pittsburgh, St. Louis, Boston, New York, Los Angeles, and San Francisco

A NUMBER of the District Councils are scheduling Fall meetings of members, including those in Pittsburgh, St. Louis, Boston, New York, San Francisco, and Los Angeles. The councils are responsible for the administration of the district activities.

Although full details of the meetings that are in prospect will be sent to the respective members and committee members in the District areas, some advance information appears below.

St. Louis, jointly with the Engineers' Club of St. Louis, is having its meeting on October 30 when President Harold L. Maxwell, E. I. du Pont de Nemours & Co., will give his address, "The Chemical Industry Advances with Materials."

Pittsburgh, on October 29, is having its annual Fall President's Night and smoker, with President Maxwell as the guest of honor. He will give a version of his district address, and there will be other discussions.

The **New England District** is scheduling its first meeting on October 29 when Committees D-20 on Plastics and D-9 on Insulating Materials are in town. Two addresses are to be given—one on Laminated Plastics, and the other on Plastics in the Textile Field.

New York's plans are still being developed, with the possibility, however, that in October a prominent engineer will discuss some of the City's engineering problems.

The **Northern** and **Southern California** District Councils, centered in **San Francisco** and **Los Angeles,** are cooperating, as they have done so closely through the years, and meetings are scheduled in Los Angeles on November 18, and on November 25 in San Francisco, at which time the 1952 ASTM Marburg Lecturer, R. C. McMaster, of Battelle Memorial Institute, will deliver his lecture "Non-Destructive Testing." These meetings are to be held jointly with the respective chapters of the Non-Destructive Society, of which Dr. McMaster will be the new President.

Philadelphia has a number of meetings in the offing—one scheduled for this Fall jointly with the Society for Experimental Stress Analysis at the Franklin Institute, October 9. It is having a National Officers' Night on February 13, at which Messrs. Harold L. Maxwell, Norman L. Mochel, and A. O. Schaefer will be the guests of honor.

Other Activities:

In addition to sponsoring one or two meetings a year, the District Councils also have other projects concerned with the welfare of the Society. Several are cooperating in membership promotion projects. Detroit is acting as host during the 1953 Spring Meeting, March 2 to 6 there, and the Philadelphia Councilors have again offered their services to the Directors to act as hosts for the 1953 Annual Meeting in Atlantic City.

Why Am I an ASTM'er?

GIVEN below is an excerpt from a letter in the files at ASTM Headquarters, one of a number which have been gathered for the use of the Administrative Committee on Member, Industry, and Public Relations. These letters set forth succinctly the reasons why men prominent in U. S. technology value membership in the Society.

From the Chief Chemist of a Western Railroad—

. . . As an ASTM member for 25 years I am well qualified to speak about the advantages of membership to any person engaged in engineering work. . . Many of the publications of the Society, particularly the monumental Book of Standards, are almost indispensable to anyone dealing with structural materials. . . .

The word "testing" in the name of the Society is somewhat misleading, as much of the value of the Society's work is not concerned with the testing of materials but with the development of authoritative specifications for many of the materials used in constructional and other engineering and technical work. . . . These specifications are universally accepted as standard. . . . Providing complete and up-to-the minute information about changes in such specifications and issuance of new ones is one of the most useful services that the Society has to offer to an engineer engaged in contracting work.

TECHNICAL COMMITTEE NOTES

Meetings and Dinner to Mark 50th Anniversary of Committee C-1 on Cement

General Invitation Extended

ALL roads lead to Philadelphia, on October 30 and 31 for present and past members, as well as friends, of Committee C-1 on Cement. On that occasion the committee will observe its fiftieth anniversary and will hold its 123*d* meeting.

Committee C-1 can well afford to celebrate fifty years of achievement and pause to look back and reminisce on the many experiences and personalities that have participated in this long period of activity. The committee was one of the original technical committees of the Society, then known as Committee C on Cement and held its first meeting in Philadelphia on October 30, 1902. The initial activity of the committee, composed of 28 members, was to prepare a specification for cement which was adopted in 1904. The modern version of this specification, C 150, is now universally recognized and used as the standard criterion for quality of portland cement in this country and in many places abroad. No small part of the achievements of the committee is the large group of standards which have been adopted by the Society in addition to the basic portland cement specifications. There are six specifications and 21 supporting methods of tests for measuring the various physical and chemical properties which are significant in obtaining good quality.

An important and valuable activity, in addition to the development of standards, has been the joint sponsorship and support with the National Bureau of Standards of the Cement Reference Laboratory. Regular inspection and calibration of equipment service has been provided to many commercial and state highway testing laboratories throughout the country. The work of the committee has been greatly helped by the exceptionally fine support and participation of the cement industry.

The actual observance of this special occasion will be centered in a dinner program to be held on the evening of October 30 at the Bellevue-Stratford Hotel, preceded by a cocktail hour. The names of the speakers have not been confirmed but it is expected that many of the "old-timers" and past officers will be there and reminiscing will be the "order of the day." It is quite certain that Bob Litchiser, the present chairman of Committee C-1, will act as toastmaster. A very attractive and extensive souvenir program is being prepared which will contain, among other things, individual pictures of all members of the committee.

Regular subcommittee meetings will be scheduled during the day on Thursday, October 30, and on Friday, October 31, closing with the 123*d* meeting of the main committee. These meetings will also be held at the Bellevue-Stratford.

The special subcommittee for this event, under the chairmanship of W. H. Klein, wishes to emphasize that all friends of the committee, in addition to past and present members, are cordially invited and urged to attend the 50th Anniversary Dinner. *Hotel room reservations* should be made directly with the Bellevue-Stratford, indicating affiliation with the ASTM committee. *Dinner reservations* should be sent to ASTM Headquarters c/o L. C. Gilbert. The dinner charge is $6 and remittance must accompany reservation request.

New Committee on Mass Spectrometry Solicits Papers for First Meeting

DURING the past year, the need for a national organization on mass spectrometry was recognized by a large number of workers in the field. After careful consideration by individuals interested in the fundamental and practical aspects, it was the consensus that the objective of such an organization should be to encourage the exchange of information among individuals interested in mass spectrometry. Emphasis would be placed on presentation at national meetings of papers on all phases of mass spectrometry, with publication to be in the most appropriate medium. Rather than to establish a new organization, it was decided that the most suitable course would be to organize a committee within the American Society for Testing Materials with the objective stated above.

The organization meeting of this new committee (ASTM Committee E-14 on Mass Spectrometry) was held in conjunction with the Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy in March, 1952. This meeting and the Conference sessions on mass spectrometry were exceptionally well attended and, for this reason, it was felt desirable to hold the initial meeting sponsored by Committee E-14 in conjunction with the next Pittsburgh Conference, March 3-7, 1953.

Papers covering theoretical and fundamental, as well as practical, aspects of mass spectrometry are earnestly desired. It will not be necessary to submit a written paper but abstracts should be submitted in duplicate. If the authors wish to publish their papers subsequent to presentation, the committee will be pleased to assist them in determining the most suitable place.

All communications should be addressed to Mr. W. Priestly, Jr., Chairman of the E-14 Subcommittee on Papers and Program, Standard Oil Development Co., Box 121, Linden, N. J. In order to provide time to assemble and print the program, December 1, 1952, has been chosen as the deadline for abstracts.

Research requires the contributions of many groups before its results may achieve practical utilization, but it is the scientist himself who produces the vital foundation upon which the whole structure rests—the new fact of nature—
Dr. C. G. Suits, Vice-President and Director of Research, General Electric Co.
—G. E. Review

Evaluation and Approval of Air-Entraining Admixtures and Additions in Cement and Concrete

Statements by Committees C-1 and C-9 Explain ASTM Procedure

EDITORS NOTE.—Committees C-1 on Cement and C-9 on Concrete and Concrete Aggregates have jointly prepared the following statements which will henceforth represent ASTM procedure in the consideration of air-entraining agents. It is felt that this procedure of making ASTM standard specifications available for both air-entraining additions and admixtures, supplemented by the necessary standard methods of tests, will be a much more practical and simplified procedure than the former process of recognition through test programs of individual agents by name. The delineation between *additions* and *admixtures* is made clear by the ASTM specification prepared for each use of the material.

THE purposeful entrainment of air in concrete may be accomplished by the incorporation of proper amounts of suitable air-entraining agents in the concrete mixture. The agent may be added directly as an *admixture* or indirectly as an *addition* interground in the portland cement.

The methods adopted by the ASTM for differentiating between an "admixture" and an "addition," and the specifications and procedure for evaluating and approving each for use, are described below.

Air-Entraining Admixtures

Prior to the approval of Tentative Specifications for Air-Entraining Admixtures for Concrete (C 260 – 50 T), there was no procedure by which such materials could be evaluated by an ASTM method or specification. However, the appearance of the names and descriptions of certain "accepted" air-entraining *additions* in Tentative Specifications for Air-Entraining Portland Cement (C 175 T) was taken by many to mean that these materials were approved also as *admixtures* for incorporation in concrete mixtures in the field. This was not the case.

C 260 T sets up requirements for air-entraining *admixtures* and provides reference to a procedure for determining the suitability of materials proposed for use as air-entraining *admixtures* to be added to concrete mixtures in the field. The procedure is described in the Tentative Method of Testing Air-Entraining Admixtures for Concrete (C 233 – 50 T).

C 260 T provides a procedure for evaluation of quality of the admixture. The responsibility for selection or approval of the admixture should be fixed by the contract.

Air-Entraining Additions

Prior to the approval of Tentative Specifications for Air-Entraining Additions for Use in the Manufacture of Air-Entraining Portland Cement (C 226 – 50 T), air-entraining *additions* (as distinguished from air-entraining *admixtures*) were accepted and included in Tentative Specifications for Air-Entraining Portland Cement (C 175 – 48 T) by Committee C-1 on Cement after a careful review of test results pertaining to the addition being considered.

Committee C-1 relieved itself of this responsibility by deleting the reference to accepted additions from C 175 – 50 T and by revising Para 3 of that specification to read as follows:

> "For the purpose of these specifications, air-entraining portland cement is the product obtained by pulverizing clinker consisting essentially of hydraulic calcium silicates, to which no additions have been made subsequent to calcination other than water and/or untreated calcium sulfate, except that there shall be interground with the clinker an *addition* meeting the requirements of the Tentative Specifications for Air-Entraining Additions for Use in the Manufacture of Air-Entraining Portland Cement (ASTM Designation: C 226 T)."

Air-entraining additions for use in the manufacture of air-entraining portland cement must now meet the requirements of C 226 T, and when interground with portland cement during manufacture shall produce an air-entraining portland cement which complies with C 175 T.

The change in procedure resulting from the promulgation of C 226 T does not seem to have been universally understood, and some confusion exists among manufacturers of air-entraining additions as to the correct procedure to be followed to obtain approval of their products.

C 226 – 52 T provides, in Section 3, two alternate requirements for cement samples for determining the suitability of air-entraining additions for use in the manufacture of air-entraining portland cement. The use of either of these two requirements depends upon whether the proposed addition is intended for general or for limited use. Because of the importance of the recent changes in the requirements for the number of cements to be used for tests of additions under Specification C 226 T there are here quoted Sections 3(*a*)(1) and 3(*a*)(2) of the 1952 text of that specification.

(1) "*Section 3. (a)(1) Cements.*—In cases where it is desired that the proposed air-entraining addition be accepted for general use, tests shall be made on six lots of cement ground at cement plants, using commercial grinding equipment. From each of three different clinkers, representing respectively Types I, II, and III portland cement, conforming to the Standard Specifications for Portland Cement (ASTM Designation C 150), two lots of cement shall be ground. One lot, the blank, shall be ground without the proposed air-entraining addition; the proposed addition shall be interground with the other lot, using the addition in such amounts as to produce the air-entrainment required in the Tentative Specifications for Air-Entraining Portland Cement (ASTM Designation C 175 T). Not more than two of the three clinkers shall be produced by or ground at the same mill. In the case of Type I clinker, the percentage of tricalcium aluminate (C_3A), computed as specified in Table I of Specification C 150, shall be not less than 12."

(2) "*Section 3. (a)(2) Cements.*—In cases where it is desired that the proposed air-entraining addition be limited in use to specific Types of cement in specific cement manufacturing plants, either or both less in number than required in Para 3(*a*)(1), the tests and test procedure shall be as specified in Para 3(*a*)(1) except that the number of cements to be tested shall be limited to those under specific consideration."

Where the addition is proposed for general use, the requirements given in Sect 3(*a*)(1) must be met. Where it is desired to limit the use of the addition to certain types of cement and to certain cement manufacturing plants, the requirements given in Sect 3(*a*)(2) govern. The inclusion of this alternate requirement permits the testing of the proposed addition with only the cement with which it is to be used, thereby eliminating the necessity of testing the proposed addition with one or more cements in which the manufacturer desiring to use the proposed addition has no interest.

The responsibility for the selection of an addition for use in the manufacture of air-entraining portland cement rests with the cement manufacturer, and in accordance with Sect 6 of C 175 T he is required, upon request, to furnish the purchaser of the cement the identity of the air-entraining agent used. Any arrangement or agreement necessary for testing an air-entraining addition should be consummated by the maker of the addition and the cement manufacturer, and all tests should be made by an accredited testing laboratory to insure that the test results will have the highest integrity possible.

Even though tests made in an accredited laboratory show that representa-

tive samples of a material proposed for use as an air-entraining addition meet all of the requirements of C 226 T, it is probable that, in some cases at least, a cement manufacturer would want to make additional tests of his own. Also, the ultimate consumer might wish to make supplementary tests to assure himself that the proposed addition would perform satisfactorily under actual job conditions. These specifications do not preclude their right to do so at any time.

When all tests have been completed and the proposed addition has been found to meet the requirements of C 226 T, the responsibility of finding someone to use the addition rests with the manufacturer of the addition. That is a matter in which the ASTM has no concern. The interest of ASTM lies in preparing the best possible specifications for use where the ASTM requirements govern.

1952 Meeting of Society for Non-Destructive Testing

AN INTERESTING series of technical sessions has been arranged for the 1952 Annual Meeting of the Society for Non-Destructive Testing in Philadelphia, October 20–23, during the National Metal Congress. R. C. McMaster, Battelle Memorial Institute, is the technical program chairman. All meetings will be at the Hotel Sylvania. Groups of technical papers in the various sessions will cover the following subjects, among others:

- Lowering Production Costs with Modern X-Ray Equipment
- New Techniques for Applying X-Ray Non-Destructive Tests
- Control and Interpretation in X-Ray Non-Destructive Testing
- The Economics of Non-Destructive Testing to Lower Production Costs
- New Methods and Applications of Ultrasonic Non-Destructive Tests to Lower Industrial Production Costs
- New Electromagnetic Non-Destructive Tests to Lower Production Costs
- Using Liquid-Penetrant and Electrical Non-Destructive Test Methods to Lower Industrial Production Costs

The Annual SNT Officers Reception and Social Meeting is Tuesday evening, October 21, and the Mehl Honor Lecture, this year by Donald T. O'Connor, U. S. Naval Ordnance Laboratory, is on Thursday afternoon, October 23, followed by installation of national officers for the coming year. At this time the retiring president, Noah A. Kahn, will hand his "non-destructively tested" baton to the President-Elect Dr. McMaster. Further information about the meeting and the interesting plan of combining registration fee and dues for the year 1952–1953 can be obtained from the Secretary, Philip D. Johnson, 1109 Hinman Ave., Evanston, Ill.

Chairmen and Secretaries of Technical Committees

ALTHOUGH complete information will be published in the 1952 Year Book on the personnel and officers of ASTM technical committees, this book will be distributed at a later date, and the following listing of chairmen and secretaries of the technical committees should be of interest and service.

Each of the committees this year held its election of officers in accordance with Society regulations which provide for these elections in the even numbered years. The asterisk indicates new officers.

Committee	Chairman	Secretary
A-1 on Steel	N. L. Mochel, Westinghouse Electric Corp., Philadelphia, Pa.	J. S. Worth, Bethlehem Steel Co., Bethlehem, Pa.
A-2 on Wrought Iron	A. D. Morris, Bayonne Bolt Corp., New York, N. Y.	L. S. Crane, Southern Railway System, Alexandria, Va.
A-3 on Cast Iron	J. S. Vanick, International Nickel Co., Inc., New York, N. Y.	*D. E. Krause, Gray Iron Research Inst., Inc., Columbus, Ohio
A-5 on Corrosion of Iron and Steel	*A. P. Jahn, Bell Telephone Laboratories, Inc., Murray Hill, N. J.	C. P. Larrabee, United States Steel Co., Vandergrift, Pa.
A-6 on Magnetic Properties	R. L. Sanford, National Bureau of Standards, Washington, D. C.	R. C. Taylor, Western Union Telegraph Co., New York, N. Y.
A-7 on Malleable Iron Castings	W. A. Kennedy, Grinnell Co. Inc., Providence, R. I.	J. H. Lansing, Malleable Founders Soc., Cleveland, Ohio
A-9 on Ferro Alloys	W. C. Bowden, Jr., Ledoux & Co., Inc., New York, N. Y.	G. F. Comstock, The Titanium Alloy Manufacturing Co., Niagara Falls, N. Y.
A-10 on Iron-Chromium, Iron - Chromium - Nickel and Related Alloys	Jerome Strauss, Vanadium Corp. of America, New York, N. Y.	M. A. Cordovi, The Babcock Wilcox Co., New York, N. Y.
B-1 on Wires for Electrical Conductors	†D. Halloran, Consolidated Edison Co. of New York, Inc., New York, N. Y.	A. A. Jones, Anaconda Wire and Cable Co., Hastings-on-Hudson, N. Y.
B-2 on Non-Ferrous Metals and Alloys	B. W. Gonser, Battelle Memorial Inst., Columbus, Ohio	G. H. LeFevre, U. S. Smelting, Refining & Mining Co., New York, N. Y.
B-3 on Corrosion of Non-Ferrous Metals and Alloys	K. G. Compton, Bell Telephone Laboratories, Inc., Murray Hill, N. J.	A. W. Tracy, The American Brass Co., Waterbury, Conn.
B-4 on Electrical Heating, Resistance, and Related Alloys	S. A. Standing, Tung-Sol Lamp Works, Inc., Bloomfield, N. J.	†Stanton Umbreit, Radio Corp. of America, Harrison, N. J.
B-5 on Copper and Copper Alloys, Cast and Wrought	G. H. Harnden, General Electric tric Co., Schenectady, N. Y.	V. P. Weaver, The American Brass Co., Waterbury, Conn.
B-6 on Die-Cast Metals and Alloys	*W. Babington, Bell Telephone Laboratories, Inc., Murray Hill, N. J.	G. L. Werley, The New Jersey Zinc Co., Palmerton, Pa.
B-7 on Light Metals and Alloys, Cast and Wrought	I. V. Williams, Bell Telephone Laboratories, Inc., Murray Hill, N. J.	†R. B. Smith, Reynolds Metals Co., Louisville, Ky.
B-8 on Electrodeposited Metallic Coatings	C. H. Sample, The International Nickel Co., New York, N. Y.	R. B. Saltonstall, The Udylite Corp., Detroit, Mich.
B-9 on Metal Powders and Metal Powder Products	W. A. Reich, General Electric Co., Schenectady, N. Y.	†F. V. Lenel, Rensselaer Polytechnic Inst., Troy, N. Y.
C-1 on Cement	R. R. Litehiser, Ohio State Highway and Research Laboratory, Columbus, Ohio	W. S. Weaver, Canada Cement Co., Ltd., Montreal, Canada
C-2 on Magnesium Oxychloride and Oxysulfate Cements	L. S. Wells, National Bureau of Standards, Washington, D. C.	*J. B. James, Oxychloride Cement Assn., Washington, D. C.
C-3 on Chemical Resistant Mortars	*Beaumont Thomas, Stebbins Engineering and Manufacturing Co., Watertown, N. Y.	*J. R. Allen, E. I. du Pont de Nemours and Co., Wilmington, Del.
C-4 on Clay Pipe	J. C. Riedel, Board of Estimate, City of New York, N. Y.	R. G. Scott, Clay Products Assn., Chicago, Ill.
C-7 on Line	*J. A. Murray, Massachusetts Institute of Technology, Cambridge, Mass.	R. S. Boynton, National Lime Assn., Washington, D. C.
C-8 on Refractories	R. B. Sosman, Rutgers University, New Brunswick, N. J.	W. R. Kerr, Armstrong Cork Co., Beaver Falls, Pa.
C-9 on Concrete and Concrete Aggregates	*L. W. Teller, U. S. Bureau of Public Roads, Washington, D. C.	†Bryant Mather, Waterways Experiment Station, Jackson, Miss.

* New Officers
† Held office since 1951

C-11 on Gypsum	L. S. Wells, National Bureau of Standards, Washington, D. C.	L. H. Yeager, Gypsum Assn., Chicago, Ill.
C-12 on Mortars for Unit Masonry	J. M. Hardesty, Bell Telephone Laboratories Inc., Murray Hill, N. J.	*J. A. Murray, Massachusetts Institute of Technology, Cambridge, Mass.
C-13 on Concrete Pipe	*R. R. Litehiser, Ohio State Highway and Research Laboratory, Columbus, Ohio	H. F. Peckworth, American Concrete Pipe Assn., Chicago, Ill.
C-14 on Glass and Glass Products	L. G. Ghering, Preston Laboratories, Butler, Pa.	F. V. Tooley, University of Illinois, Urbana, Ill.
C-15 on Manufactured Masonry Units	J. W. Whittemore, Virginia Polytechnic Inst., Blacksburg, Va.	M. H. Allen, Structural Clay Products Inst., Washington, D. C.
C-16 on Thermal Insulating Materials	E. R. Queer, The Pennsylvania State College, State College, Pa.	J. M. High (*acting*), The Ruberoid Co., New York, N. Y.
C-17 on Asbestos-Cement Products	H. R. Snoke, National Bureau of Standards, Washington, D. C.	C. C. Kelsey, Asbestos Cement Products Assn., New York, N. Y.
C-18 on Natural Building Stones	L. W. Currier, U. S. Geological Survey, Washington, D. C.	F. S. Eaton, Research and Design Inst., New Haven, Conn.
C-19 on Structural Sandwich Constructions	*E. W. Kuenzi, U. S. Forest Products Laboratory, Madison, Wis.	*B. D. Beamish, Honeycomb Co. of America, Inc., Mount Vernon, N. Y.
C-20 on Acoustical Materials	H. A. Leedy, Armour Research Foundation. Chicago, Ill.	H. J. Sabine, The Celotex Corp., Chicago, Ill.
C-21 on Ceramic Whiteware	*C. G. Harman, Battelle Memorial Inst., Columbus, Ohio	R. F. Geller, National Bureau of Standards, Washington, D. C.
C-22 on Porcelain Enamel	W. N. Harrison, National Bureau of Standards, Washington, D. C.	G. H. Spencer-Strong, Pemco Corp., Baltimore, Md.

D-1 on Paint, Varnish, Lacquer and Related Products	W. T. Pearce, Bala-Cynwyd, Pa.	*W. A. Gloger, National Lead Co., Brooklyn, N. Y.
D-2 on Petroleum Products and Lubricants	O. L. Maag, Timken Roller Bearing Co., Canton, Ohio	W. T. Gunn, American Petroleum Inst., New York, N. Y.
D-3 on Gaseous Fuels	A. W. Gauger, The Pennsylvania State College, State College, Pa.	K. R. Knapp, American Gas Assn., Cleveland, Ohio
D-4 on Road and Paving Materials	*C. A. Carpenter, Bureau of Public Roads, Washington, D. C.	B. A. Anderton, The Barrett Div., Allied Chemical and Corp., Edgewater, N. J.
D-5 on Coal and Coke	*W. W. Anderson, Commercial Testing and Engineering Co., Chicago, Ill.	*O. P. Brysch, Institute of Gas Technology, Chicago, Ill.
D-6 on Paper and Paper Products	W. R. Willets, Titanium Pigment Corp., New York, N. Y.	R. H. Carter, General Electric Co., Schenectady, N. Y.
D-7 on Wood	L. J. Markwardt, U. S. Forest Products Laboratory, Madison, Wis.	*L. W. Smith, U. S. Forest Service, Washington, D. C.
D-8 on Bituminous Waterproofing and Roofing Materials	*H. R. Snoke, National Bureau of Standards, Washington, D. C.	G. W. Robbins, The Texas Co., New York, N. Y.
D-9 on Electrical Insulating Materials	A. H. Scott, National Bureau of Standards, Washington, D. C.	*B. E. Ely, E. I. du Pont de Nemours and Co., Wilmington, Del.
D-10 on Shipping Containers	T. A. Carlson, U. S. Forest Products Laboratory, Madison, Wis.	*J. H. Toulouse, Owens-Illinois Glass Co., Toledo, Ohio
D-11 on Rubber and Rubber - Like Materials	Simon Collier, Johns-Manville Corp., New York, N. Y.	A. W. Carpenter, The B. F. Goodrich Co., Akron, Ohio
D-12 on Soaps and Other Detergents	J. C. Harris, Monsanto Chemical Co., Dayton, Ohio	H. R. Suter, Wyandotte Chemicals Corp., Wyandotte, Mich.
D-13 on Textile Materials	W. D. Appel, National Bureau of Standards, Washington, D. C.	W. H. Whitcomb, Cranston, R. I.
D-14 on Adhesives	*Gerald Reinsmith, Office, Chief of Ordnance, ORDTB, Washington, D. C.	L. M. Perry, Nashua Corp., Nashua, N. H.
D-15 on Engine Antifreezes	H. R. Wolf, General Motors Corp., Detroit, Mich.	†C. F. Graham, Wyandotte Chemicals Corp., Wyandotte, Mich.
D-16 on Industrial Aromatic Hydrocarbons	D. F. Gould, The Borden Co., Philadelphia, Pa.	*F. J. Powell, The Barrett Div. Allied Chemical and Dye Corp., Philadelphia, Pa.
D-17 on Naval Stores	V. E. Grotlisch, Production and Marketing Administration, Dept. of Agriculture, Washington, D. C.	W. A. Kirklin, Hercules Powder Co., Wilmington, Del.
D-18 on Soils for Engineering Purposes	E. J. Kilcawley, Rensselaer Polytechnic Inst., Troy, N. Y.	W. G. Holtz, Bureau of Reclamation, Denver, Colo.
D-19 on Industrial Water	Max Hecht, 25 Valley Rd., Drexelbrook, Drexel Hill, Pa.	R. T. Sheen, Philadelphia, Pa.

ASTM Twenty-Five Years Ago

The stormy early years of the Society were recalled at its Twenty-Fifth Anniversary dinner, held in French Lick, Ind., June 22, 1927. The occasion was the presentation of three honorary memberships. The following quotes from the acceptance speeches provide interesting glimpses into early Committee activities of the Society:

Richard L. Humphrey (Consulting Engineer) "...Twenty-five years ago cooperation between producer and consumer was an unknown thing; every engineer wrote his own specifications; he looked askance at the producer of materials as a man trying to fool him."

S. T. Wagner (Reading Co.) "...In the early days, and for a great many early days on that iron and steel committee there were some really strenuous times. I have heard it said lately that nowadays we do not know what real discussion is. I do not think anybody had any idea in those days what heat treatment of steel was, but I tell you if we had not any heat treatment of steel we had heat treatment in the discussion."

A. A. Stevenson (Standard Steel Works Co.) "...I certainly do appreciate the honor that has been conferred upon me. I always felt that I had been signally honored when I was elected first president from the ranks of the producers; it was a sort of an unwritten law at that time that a producer should not be president, and I think there was a general feeling that it would be detrimental to the best interests of the Society to have a producer in the presidential chair. It meant a great deal to me, however, because it seemed to be an indication of a growth of more cordial feeling on the part of the consumers towards the producers, and I knew that that would mean much for the work."

Capacitor Paper Measurement

THE National Bureau of Standards has prepared a circular on measurement of thickness of capacitor paper, in which are discussed the three measurement methods: direct observation across an edge section with a micrometer microscope; measurement of separation of two geometric surfaces between which one or more specimens are placed; determination of the mass of a definite area of sample and computation of the thickness by means of a density parameter.

The pamphlet, which can be obtained from the Bureau at a cost of 15 cents, contains a statistical analysis of the results obtained in a number of laboratory measurements made at NBS, and gives suggestions to guide others working with the problem.

(*Continued from page 26*)

D-20 on Plastics	*R. K. Witt, Johns Hopkins Univ., Baltimore, Md.	*G. M. Armstrong, Tennessee Eastman Div., Eastman Kodak Co., Kingsport, Tenn.
D-21 on Wax Polishes and Related Material	†W. W. Walton, National Bureau of Standards, Washington, D. C.	B. S. Johnson, Franklin Research Co., Philadelphia, Pa.
D-22 on Methods of Atmospheric Sampling and Analysis	L. C. McCabe, Bureau of Mines, Dept. of Interior, Washington, D. C.	H. H. Schrenk, Industrial Hygiene Foundation, Pittsburgh, Pa.
D-23 on Cellulose and Cellulose Derivatives	F. A. Simmonds, U. S. Forest Products Laboratory, Madison, Wis.	W. W. Becker, Hercules Powder Co., Wilmington, Del.

E-1 on Methods of Testing	J. R. Townsend, Bell Telephone Laboratories, Murray Hill, N. J.	P. J. Smith, American Society for Testing Materials, Philadelphia, Pa.
E-2 on Emission Spectroscopy	B. F. Scribner, National Bureau of Standards, Washington, D. C.	J. H. Coulliette, University of Chattanooga, Chattanooga, Tenn.
E-3 on Chemical Analysis of Metals	J. W. Stillman, E. I. du Pont de Nemours and Co., Wilmington, Del.	H. Kirtchik, General Electric Co., Lynn, Mass.
E-4 on Metallography	L. L. Wyman, General Electric Co., Schenectady, N. Y.	Mary Norton, Watertown Arsenal, Watertown, Mass.
E-5 on Fire Tests of Materials and Constructions	A. L. Brown, Associated Factory Mutual Fire Insurance Cos., Boston, Mass.	*R. C. Corson, Associated Factory Mutual Fire Insurance Cos., Boston, Mass.
E-6 on Methods of Testing Building Constructions	J. A. Liska, U. S. Forest Products Laboratory, Madison, Wis.	†R. A. Biggs, Franki Foundation Co., New York, N. Y.
E-7 on Non-Destructive Testing	J. H. Bly, Pratt & Whitney Aircraft, East Hartford, Conn.	D. T. O'Connor, Naval Ordnance Laboratory, Silver Spring, Md.
E-8 on Nomenclature and Definitions	P. V. Faragher, Aluminum Company of America, Pittsburgh, Pa.	P. J. Smith, American Society for Testing Materials, Philadelphia, Pa.
E-9 on Fatigue	R. E. Peterson, Westinghouse Electric Corp., East Pittsburgh, Pa.	O. J. Horger, The Timken Roller Bearing Co., Canton, Ohio
E-10 on Radioactive Isotopes	D. M. McCutcheon, Ford Motor Co., Dearborn, Mich.	C. E. Weber, General Electric Co., Schenectady, N. Y.
E-11 on Quality Control of Materials	H. F. Dodge, Bell Telephone Laboratories, New York, N. Y.	O. P. Beckwith, Alexander Inc., Yonkers, N. Y.
E-12 on Appearance	M. R. Paul, Eagle-Picher Sales Co., Washington, D. C.	Daniel Smith, Interchemical Corp., New York, N. Y.
E-13 on Absorption Spectroscopy	*E. J. Rosenbaum, Sun Oil Co., Norwood, Pa.	W. S. Young, Atlantic Refining Co., Philadelphia, Pa.
E-14 on Mass Spectrometry	W. S. Young, Atlantic Refining Co., Philadelphia, Pa.	J. G. Hutton, General Electric Co., Schenectady, N. Y.

Handbook on Radiological Monitoring

THE increasing use of radioactive materials in industry, medicine, and research has made it essential that certain minimal precautions be taken to protect both the users of the equipment and the public. Recommendations contained in brief in a new National Bureau of Standards publication, Handbook 51 titled "Radiological Monitoring Methods and Instruments," represent what is believed to be the best available opinion on the subject at present.

The report covers principles and determination of hazards, radiation detectors, measuring instruments, personnel monitoring instruments, instrument requirements, and radiation-survey methods.

Copies of the 33-page booklet can be obtained from the Superintendent of Documents, Washington, D. C., for 15 cents.

Association Head Asks Higher Tariffs for Instruments

KENNETH ANDERSEN, executive vice-president, Scientific Apparatus Makers Assn., has challenged the State Department's recent statement that we are in a period of rising tariffs. Mr. Andersen pointed out that the over-all average tariff on industrial products has been reduced about 10 per cent as a result of the 24-nation agreements made in Torquay, England, ending April 20, 1951.

Andersen said that current rates for instruments and apparatus, although higher than over-all figures on imports, are low for products manufactured in small lots to meet a small demand and whose cost is accounted for largely by highly skilled hand labor. Due to the high standard of living and resultant high costs of skilled labor, instrument producers in this country are unable to vie with their foreign competitors even under the 51 per cent (average) tariffs. American companies, he concluded, have been able to hold their own because their products are superior and because they give better service.

Andersen further commented that the scientific instrument and laboratory industry is essential both strategically and economically, and that for the country to be dependent upon other nations for its instruments would be fatal in the case of all-out war.

NBS Handbook on X-ray Protection Design

THIS handbook contains primary factual data and basic principles necessary for designing shielded X-ray installations. It is based on the recommendations of the National Committee on Radiation Protection. Architects and designers of buildings and rooms in which X-rays will be used for fluoroscopy, radiography, or therapy can derive much helpful information from the handbook's discussion of these recommendations and from its sample design problems and methods of computing barriers for real installations.

In discussing typical cases, the handbook gives a variety of examples to illustrate the application of the fundamental principles and recommendations. It carries out detailed calculations showing how to arrive at the optimum conditions providing sufficient protection for safe operation with the most economical form of radiation shielding. Protection requirements both for persons working with the equipment and for persons in adjoining areas are considered.

The handbook undertakes the explanation of certain assumptions and recommendations and includes detailed design specifications. These rules and recommendations are based on the best data available at this time but may require revision as knowledge of the field of X-ray protection increases.

Copies of the 36-page pamphlet can be obtained from the Government Printing Office, Washington, D. C., for 15 cents.

Quality Contral Manual in Japanese

COPIES of the authorized Japanese reprint of the ASTM Manual on Quality Control of Materials were recently received at Headquarters from the Union of Japanese Scientists and Engineers who undertook the publication.

According to K. Koyanagi, Managing Director of the Union, profits from the sale of the Japanese edition "will be donated to the Deming Prize fund which was founded last year by the Union in memory of the great services of Dr. Deming in the dissemination and application of statistical methods."

This publication is further evidence of the continuing keen interest—long observed at Headquarters—of Japanese technical men in scientific matters.

A CRITICAL DEFENSE METALS PROBLEM MERITS YOUR STUDY

Critical Cobalt Situation Discussed at ODM-ASTM Meeting

Diversified Representation, Including Other Interested Societies; Study Conservation Measures and Arrangements Needing Immediate Investigation

At the request of the Office of Defense Mobilization a day's meeting on the Conservation of Cobalt was held June 9, 1952, at the Headquarters of the American Society for Testing Materials. This type of conference is one of the methods which ASTM is using to fulfill the provisions of the ODM-ASTM contract. J. R. Townsend, of the Office of Defense Mobilization presided. The American Society for Testing Materials was represented by Chairmen and Secretaries of the seven Product Committees primarily interested, and four members of the Headquarters Staff. The Society of Automotive Engineers designated one to represent its interests, together with seven of the principal American manufacturers of jet, gas, and combustion turbine engines. A total of 18 was in attendance.

In his opening remarks Mr. Townsend, Consultant on Conservation of Materials to the Director of the Office of Defense Mobilization, explained in considerable detail the philosophy leading to the arrangement between ODM and ASTM for meetings of this character. He then outlined the general responsibilities of ASTM under this arrangement as follows: (1) the compilation and organization of pertinent factual knowledge and reliable opinion and (2) the indoctrination of industry with the problem faced and ways and means for its solution.

In using ASTM as a center for committee organization and action there are available for assistance all of its widely diversified committees, its approximately 7000 members, and the great number of companies, both large and small, represented in the ASTM membership.

ASTM will make available through its publications, or otherwise, factual knowledge, reliable opinion, and pertinent data. It is believed this will be used by the interests primarily concerned, with their background of knowledge relating to the manufacture and utilization of products in individual fields.

Under no circumstances will ASTM recommend or directly advise. It will not, in any sense of the word, order anybody to do anything. It will not recommend to any Governmental Department or Agency action or procedure that should or should not be taken.

If requested by the Director of ODM, pertinent information could be made available to him as an expression of informed opinion from ASTM committees. This information would not be used as the basis for issuing any orders.

The Director of ODM at his discretion may request that DPA or NPA, or both, review a specific problem in a comprehensive way with industry and reach the conclusion justified in the light of available facts.

This work is being undertaken to assure an adequate supply of the materials required for the current partial mobilization and at the same time provide for full mobilization in the event that should ever become necessary. To accomplish this objective there must be an adequate national stock pile. At the same time it must be constantly kept in mind that civilian economy should be disturbed as little as practicable.

This undertaking is of such breadth and national importance that it should have the benefit of the best informed talent in their respective fields "across the board."

Appraising the present situation among the scarce strategic materials it appeared that cobalt was the material that should be investigated at this time because of its unusual properties, its widely diversified industrial applications, and its limited availability.

Cobalt greatly improves the fatigue resistance, creep rupture and tensile strength, mechanical shock resistance, and dimensional stability required to assure satisfactory performance of the materials under the severe stress and temperature conditions imposed on them in the jet and gas turbine engines which are being used at a rapidly increasing rate in aircraft. Much can be accomplished in this area by conservation. The problem requires great care and serious consideration because the applications are critical ones.

Cobalt has the unique property of increasing, to a greater extent than any other material, the magnetic properties of metals with which it is alloyed. In many instances, the space available in aircraft for essential strategic equipment using less effective magnetic materials would be insufficient.

Ceramic protective coverings being developed by the National Bureau of Standards are for the purpose of increasing the effective service life of critical scarce materials used in aircraft jet and gas turbine engines. They are not for the purpose of improving the metallurgy of the engine parts. In general, these coatings do not contain cobalt.

Conservation is most effectively accomplished by employing the unique properties of materials in the best possible manner. In the case of metals, one method would be to use the least amount of material that would consistently provide the desired properties.

The Conference Emphasized the Importance of the Following Items:

It has been estimated that in the event of full mobilization the available

Copies of Complete Minutes of Meeting Available

If you wish a copy of the complete minutes of the June 9 meeting on cobalt conservation, use the coupon below or write ASTM Headquarters.

ASTM Headquarters
1916 Race Street
Philadelphia 3, Pa.

Please send me a complimentary copy of the cobalt conference minutes abstracted in the September ASTM BULLETIN.

Name.....

Position or Department.....

Company.....

Address.....

supply of cobalt would be approximately one-half that required. Of that total about five-sixths would be required by the Armed Forces for direct or supporting use.

Substantially the entire supply of cobalt, presently available to the "free world," comes from North Africa.

Shipments of cobalt ore, concentrates, and refined metallic cobalt are subject to the hazards of sea warfare.

Accordingly, a project should be initiated at the earliest possible date for developing materials that would satisfactorily replace cobalt alloys in as many applications as practicable.

In the light of present knowledge concerning the characteristics of materials for applications involving simultaneous exposure to flame and high mechanical stresses, both sustained and intermittent, and providing the minimum distortion of parts, the necessity for great amounts of cobalt was indicated.

Cobalt is being conserved in a number of applications by replacing cobalt or high cobalt alloys with others having substantially less or no cobalt. The substitute materials have proved satisfactory as regards both fabrication and service performance.

There are materials containing much less cobalt than at present that will apparently provide the characteristics required for satisfactory service in jet and gas turbine engines. Work on the commerical production of these promising substitute materials should be continued most aggressively. It was reported that a number of research programs are in progress for developing substitute materials to accomplish this objective.

There should be a reappraisal of the operating temperatures and the sustained and intermittent loadings occurring in jet and gas turbine type engines to provide reliable design data and thus assure the most effective application of materials.

It would be particularly helpful if there were available detailed information concerning the preferred or recommended usage of strategic materials said to have been established by the Department of Defense for the guidance of manufacturers of aircraft engines.

The use of alternate or substitute materials might be substantially increased if the practice of listing on drawings satisfactory alternate materials for individual parts were more extensively applied.

Areas in urgent need of research were recognized.

Specific Items Disclosed During the Discussion by ASTM Committee Chairmen were:

1. Increasingly large quantities of cobalt are used to provide the fatigue resistance, high creep rupture and tensile strength, mechanical shock resistance and dimensional stability required in the moving parts of jet and gas and combustion type turbine engines in order to assure their satisfactory performance under the stress and temperature conditions at which they are required to operate.

2. High temperature protective ceramic coatings being developed by the National Bureau of Standards, now attracting attention as possible protection for high temperature alloy aircraft engine parts are for a novel purpose. It is believed they will substantially extend the effective service life of the coated parts by protecting them from the erosion and corrosion to which they are otherwise exposed. In no way do they affect the metallurgy of the protected parts. In general, these coverings contain little, if any, cobalt.

3. Very substantial conservation of cobalt has been satisfactorily accomplished in the blading for "ground level" turbines for power, industrial and similar applications through the substitution of materials and improved manufacturing processes.

4. ASTM publications STP 100 and STP 124, already issued, report the characteristics of wrought steels and stainless steels.

5. This year data are being collected on both low alloy and so-called "superalloy" steels.

6. It is estimated the current annual requirements for cobalt as a dryer in the paint, varnish and floor covering industries is approximately 280 tons. Very limited progress has been made in developing substitutes for cobalt in those fields.

7. Cobalt driers are prohibited in outside paints by the current NPA order.

8. There do not appear to be any promising substitutes for cobalt as a drier in printing inks. The annual domestic requirement in this field was reported to be approximately 70 tons.

9. It is believed that, in general, reduction of cobalt in driers would adversely affect high speed rotary printing press operation, production schedules, slow down "finish lines" and be found uneconomical. So far no satisfactory substitute, such as infrared and similar drying processes, has been found for cobalt.

10. Cobalt increases, to a greater extent than any other material, the magnetic properties of metals with which it is alloyed.

11. The highly competitive nature of the permanent magnet business has already accounted for substantial weight reduction and effective application of materials through improved design.

12. A new magnetic material called "Bismanol" results from alloying bismuth and manganese. It may be found this material will prove a satisfactory substitute for cobalt in permanent magnets.

13. Experience has demonstrated that in order to assure adequate adherence to steel of enamel coating the first coat must contain 0.30 per cent to 0.50 per cent cobalt; more frequently of the order of 0.50 per cent.

14. Suitable nickel flash coatings may permit using ceramic enamels having lower cobalt content and at the same time assuring adequate adherence to steel.

15. Cobalt salts are not used as extensively as previously for decolorizing enamelware.

16. Manganese salts have not proven satisfactory substitutes for cobalt as discolorizing agents for glassware.

17. Cobalt compounds are required as catalyzers in the Petroleum Refining Industry.

18. Cobalt is required by the pharmaceutical industry in the production of vitamin B-12.

19. Cobalt is required in many geographical areas as a supplement in livestock feeds; particularly for swine and ruminants. It has not been approved as a supplement in marginal zones such as poultry and pet foods. Its use has been eliminated from commercial fertilizers.

20. Cobalt is used in the electroplating industry in certain types of nickel-plating baths.

21. In general, it has been found proposals received relating to the mining and treatment of cobalt ores are not commercially sound.

Producers of Special Steels Such as Those for Operation at High Temperature in Jet Engines and Gas Combustion Type Turbine Engines and the High Speed Tool Steels Developed the Following Items:

1. The efficient recovery of scrap is one of the most promising approaches to cobalt conservation.

2. Tungsten and molybdenum scrap can be classified with sufficient accuracy to assure its being used correctly. On the contrary, the classification of cobalt scrap with sufficient accuracy to assure its correct use is extremely difficult.

3. Distinct differences of opinion developed concerning the practical use, with safety, of so called "hash alloy."

4. Developing melting and fabricat-

ing techniques required for new alloys, particularly those containing titanium, is very expensive and time consuming. Restricting development work to as small a number of new alloys as practical would be particularly helpful.

5. Cobalt is required for the production of high speed tool steels. It has the unusual ability of improving their "productive capacity."

6. It was stated that by using the proper amount of vanadium in tool steels they can be given characteristics substantially equivalent to those they would have had through using cobalt.

7. Reference was made to a recently announced development for applying coolants to steel cutting tools at high pressure. While a number of associated problems require solution this development apparently has promise.

8. Work is in progress which has for its purpose developing materials of the nimonic type that would satisfactorily replace cobalt alloys now used in jet and gas turbine and combustion turbine type engines.

9. Work is being done in the development of castable alloys to be used for stationary parts of aircraft gas turbines. It is believed these, more perhaps than any other parts, have been overdesigned in gas turbines.

10. It is believed that if it were possible to define more clearly than at present the properties of materials that could be satisfactorily used for turbine nozzles, nozzle partitions, and nozzle vanes, substantial savings in cobalt could be effected.

11. While most of the available substitute alloys retain some nickel they virtually eliminate use of cobalt. Replacing cobalt with nickel would be advantageous. The availability of cobalt is measured in pounds and that of nickel is measured in tons.

Items Concerning Jet Engines and Gas and Combustion Turbine Engineering:

1. Some authoritative Agency should determine and specify the limits of the elements constituting recognized "hash alloys."

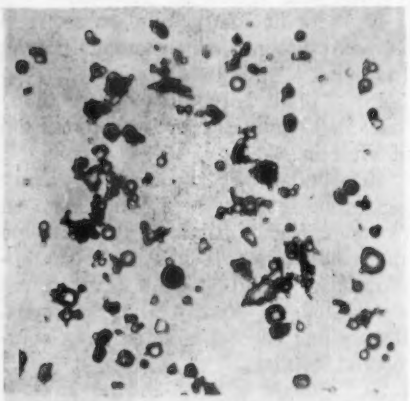
2. Substantial reduction in the amount of cobalt bearing material used in aircraft gas turbines has been accomplished through improved forging practice.

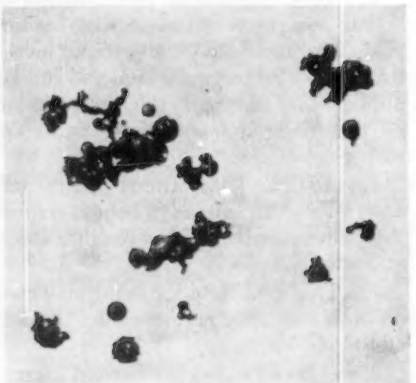
3. Substitution of M-252 material for S-816 has effected still further conservation of cobalt bearing material. On test M-252 has performed satisfactorily although its maximum permissable operating temperature is probably about 100 degrees lower than that of S-816.

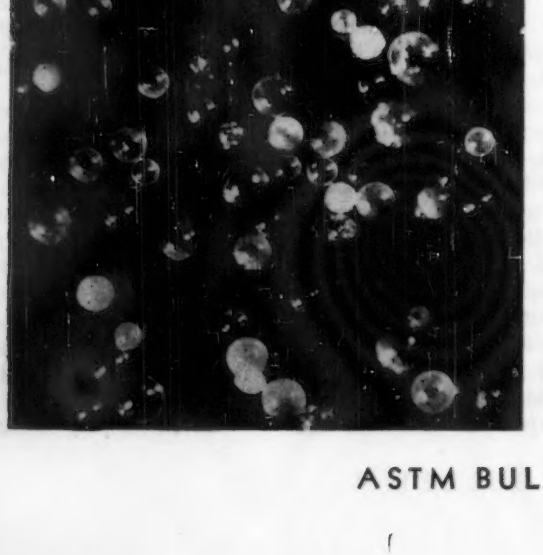
4. While cobalt alloys are currently used for both rotating blades and stationary vanes it is believed that nickel-base alloys will be available shortly which will be satisfactory for stationary vanes.

5. It is believed forged nimonic materials could be developed that would be satisfactory for blading.

6. A castable alloy is desired for blading. Forging facilities are "critical" as well as alloying elements. A program for utilizing castable alloys could be expanded more readily than one could be expanded for forgings.







Fly Ash—The Dust from Smoke

Second prize, Students Section, Eighth ASTM Photographic Exhibit, by R. L. Handy, Iowa State College.

Upper left: fly ash 750 ×, from Louisville Electric Co., being used in soil stabilization studies at Iowa State. *Upper right:* Magnetic fraction 250 ×.

Lower: hollow fly ash 100 ×, from Indiana and Michigan Electric Co. It floats on water.

More Unsolved Problems

Additional Research Projects from ASTM Committees

STATEMENTS of research problems submitted by the technical committees of the Society have been collected in a pamphlet, "Some Unsolved Problems," which may be obtained upon request to ASTM Headquarters, 1916 Race St., Philadelphia 3, Pa.

These problems have been presented in series in the BULLETIN and will continue in the issues through 1952. This issue includes:

Masonry Mortar Shrinkage
Fundamentals of Asphaltic Adhesion
Effect of Shape of Notch
Fatigue Properties of Timber Fasteners

Masonry Mortar Shrinkage

Statement of Unsolved Problem Contributed by Committee C-12 on Mortars for Unit Masonry

Problem:

To settle the controversy as to whether "Mortar shrinks away from the brick" to produce "separation cracking."

Present State of Knowledge:

C. C. Connor (1) has proposed the above thesis, based on observation of shadow lines between mortar and bricks. Others maintain that these apparent flaws "result from the techniques of the mason." The latter school of thought base their conclusions after much observation of masons at work, followed by testing for leakage and disassembly of the wall. Mortars molded in metal have shrinkages ranging up to 0.40 per cent; but as used in masonry the shrinkage is much less.

Questions That Need to Be Answered:

What can you contribute to this controversy?

Introductory References:

(1) C. C. Connor, "Factors in the Resistance of Brick Masonry Walls to Moisture Penetration," *Proceedings*, Am. Soc. Testing Mats., Vol. 48, p. 1020 (1948); Discussion, p. 1040.

(2) "Principles of Brick Engineering," Structural Clay Products Inst., Washington, D. C.

Additional information may be obtained from J. M. Hardesty, Bell Telephone Laboratories, Inc., Murray Hill, N. J.

Fundamentals of Asphaltic Adhesion

Statement of Unsolved Problem Contributed by Committee D-8 on Bituminous Waterproofing and Roofing Materials

Problem:

The adhesive characteristics of asphalts are directly involved in many commercial uses. A better understanding of the roles played by physical and chemical factors affecting the degree and permanency of asphalt adhesion would be valuable in selecting and applying asphalts where adhesion is of prime consideration. Directly involved in this problem are the physical and chemical characteristics of the surfaces with which the asphalt is in contact.

Present State of Knowledge:

Some work has been done with respect to the value of certain additives to asphalt but little apparently with respect to the factors inherent in asphalt which affect adhesion or the possibility of improving these inherent factors.

Questions That Need to Be Answered:

1. How can asphaltic adhesion be measured both as to initial value and permanency so as to distinguish the relative importance between physical-chemical factors and purely mechanical factors?
2. What compounds or characteristics of asphalt *per se* are related to adhesion?
3. What are the fundamental factors affecting adhesion of asphalts to various types of surfaces considered from the standpoint of the various materials to which asphalts are adhered in commercial application, for example, mineral aggregates, roofing granules, metals, etc.?

Introductory References:

(1) Prevost Hubbard, "Adhesion of Asphalt to Aggregates in Presence of Water," Asphalt Inst. (1939).

(2) V. B. Saville and E. O. Axon, "Adhesion of Asphaltic Binders to Mineral Aggregates," *Proceedings*, Association of Asphalt Paving Technologists, p. 86 (1937).

(3) Herbert Abraham, "Asphalt and Allied Substances," Adhesiveness (of Asphalt); Test (for Adhesiveness), pp. 1017, 1381.

(4) Victor Nicholson, "Adhesion Tension in Asphalt Pavement, Its Significance and Methods Applicable in Its Determination," *Proceedings*, Association of Asphalt Paving Technologists, p. 28 (1932).

(5) August Holmes, "Evaluating the Adhesive Properties of Asphalt," *Proceedings*, Am. Soc. Testing Mats., Vol. 39, p. 1140 (1939); Discussion, p. 1150.

Additional information may be obtained from E. H. Berger, 22 E. Fortieth St., New York 16, N. Y.

Effect of Shape of Notch

Statement of Unsolved Problem Contributed by Committee D-9 on Fatigue

Problem:

Machine parts commonly fail at regions of geometrical discontinuity, such as grooves, fillets, oil holes, keyways, and other necessary notches. Laboratory investigations have studied, to some degree, the effect of a particular notch upon different materials, and, also to some extent, the effects of notches of different severity upon a material. However, for adequate design of parts and structures, information is needed concerning the extent to which shape as well as severity of notch may influence fatigue strength.

Present State of Knowledge:

Experience has shown that sharp notches may be very detrimental to parts that undergo repeated stressing. On the other hand, experience also teaches that sometimes small scratches on large parts do not develop so drastic a reduction in fatigue strength as might be feared.

Laboratory investigations have shown that the theoretical stress concentration factor is not a sufficient index of the influence of a notch upon fatigue strength. There is considerable evidence that the radius of the root of a notch as well as the theoretical stress concentration factor may be important in determining the fatigue strength reduction factor caused by the notch. Other parameters of shape have been little studied.

Questions That Need to Be Answered:

1. What is the influence of root radius upon the fatigue strength reduction caused by a particular type of notch (such as a circumferential groove) of fixed severity, in various materials?
2. Does this influence vary with notch severity?
3. Is it independent of notch shape, or must this be further investigated for different types of notches (for example, grooves, fillets, transverse holes)?
4. Is the influence of notch shape different for different types of loading (tension, torsion, bending)?
5. Is the influence of notch shape (particular, root radius) related to grain size of the material?

Introductory References:

(1) H. Neuber, "Theory of Notch Stress," J. W. Edwards Press, Ann Arbor, Mich., pp. 155–169 (1946).

(2) M. S. Paterson, "Notch Sensitivity of Metals," "The Failure of Metals by

Fatigue," Melbourne University Press, pp. 309–335 (1947).

(3) H. J. Grover, "Fatigue Notch Sensitivities of Some Aircraft Material," *Proceedings*, Am. Soc. Testing Mats., Vol. 50, p. 717 (1950).

Additional information may be obtained from T. J. Dolan, Talbot Laboratory, University of Illinois, Urbana, Ill.

Fatigue Properties of Timber Fasteners Under Repeated Loads

Statement of Unsolved Problem Contributed by Committee E-9 on Fatigue

Problem:

The design of the connections in any structure or article made of wood is most critical. Nails, bolts, screws, and connectors are among the mechanical fastenings most commonly used for joints in wood. No concrete data are available on how joints using these types of fastenings withstand repeated loading. Because in many designs the joint in any member is the limiting factor in the design, basic information on the resistance of typical joints to fatigue loading is needed.

Present State of Knowledge:

In wood the appearance of a fatigue failure is not greatly different from that due to a static loading. Thus, in service it is difficult to determine whether the cause of failure can be definitely attributed to fatigue rather than structural damage due to a single loading. There has been little or no test work on the fatigue resistance of mechanically fastened joints; any work started should be directed toward obtaining fundamental information.

Tests of this type should simulate typical joints as actually used, to obtain data on how some of the simpler joints react when subjected to repeated loading. For example, in the sway bracing on a timber trestle, a 4- by 8-in. diagonal member is bolted to a pile or 12- by 12-in. post using a $\frac{3}{4}$-in. diameter bolt and a grid plate. A joint of this type is detailed in Fig. 705 of the AREA Manual (1). The loading on this joint could be simulated in test and *S-N* curves be determined for repeated loadings.

Questions That Need to Be Answered:

Any information on the behavior of mechanically fastened joints will assist the designer in making a rational analysis of structures that are subjected to repetitive loading.

Introductory References:

(1) American Railway Engineering Association, "Manual of Wood Bridges and Trestles."

(2) W. C. Lewis, "Fatigue of Wood and Glued-Wood Constructions," *Proceedings*, Am. Soc. Testing Mats., Vol. 46, p. 814 (1946).

Additional information may be obtained from T. J. Dolan, Talbot Laboratory, University of Illinois, Urbana, Ill.

PERSONALS...

News items concerning the activities of our members will be welcomed for inclusion in this column.

NOTE—*These "Personals" are arranged in order of alphabetical sequence of the names. Frequently two or more members may be referred to in the same note, in which case the first one named is used as a key letter. It is believed that this arrangement will facilitate reference to the news about members.*

Fred B. Behrens has been appointed Vice-President of Wilshire Oil Co., Inc., Los Angeles, Calif. In addition to retaining his former responsibilities as manager of manufacturing, Mr. Behrens is now in charge of engineering, pipeline and storage operations, and crude-oil purchases and exchanges. He has been with the firm since 1936.

Michael J. Bozsin, formerly Process Research Engineer, Ferro Enamel Corp., Cleveland, Ohio, has been advanced to the position of Chief Chemist. Associated with Ferro's Chemistry Department since 1929, he is a leading authority on gas analysis in porcelain enameling plants. Mr. Bozsin is active in the work of ASTM Committee C-22 on Porcelain Enamels and is cooperating particularly in that committee's program to publicize its activities throughout the porcelain enamel industry.

George D. Calkins, until recently with the Industrial Nucleonics Corp., Columbus, Ohio, is now Project Chemist, Bendix Aviation Corp., Detroit, Mich.

Otis R. Carpenter has been appointed an executive assistant of the Barberton, Ohio, works of The Babcock & Wilcox Co. His previous position was as Director of the Works Control Laboratory at the Barberton works.

Myron Ceresa has been appointed Manager of Electroplating Projects for the Special Products Development Division, Westinghouse Electric Corp., Pittsburgh, Pa. In his new capacity, Mr. Ceresa will be in charge of laboratory operations, including development, pilot plant, and technical service work.

G. H. Clamer, a Past-President and Honorary Member of the Society, in accepting the 50-Year Membership Certificate for his company (Ajax Metal Division of H. Kramer & Co., Philadelphia, Pa.) at the ASTM 50th Anniversary Meeting in June, held the unique distinction of being the only individual representing the same company in the Society for the 50-year period. This year also marks for Mr. Clamer a half-century of membership in the American Electrochemical Society of which he was a charter member.

Irwin C. Clare has been made an Assistant Director of Research for C. K. Williams Co., Easton, Pa. In his new post he will supervise research on the application of pigments in paints, rubber, plastics, floor coverings, and allied lines. During the past three years he has been Chief of the Paint Section of the Williams Research Laboratory.

Laurence R. Clarke, formerly Factory Manager, has been named Vice-President in Charge of Production, Haartz-Mason, Inc., Watertown, Mass.

Maurice J. Day, for the past 15 years affiliated with the U. S. Steel Co. in various capacities, more recently as Metallurgical Engineer in the Pittsburgh plant, has been named Manager, Materials and Processes Division, Armour Research Foundation, Illinois Institute of Technology, Chicago, Ill. In his new assignment Dr. Day will direct research and development activities of 300 scientists and administrative personnel. An expert in the metals field, he is the author of technical articles on the making and treating of steel, holding several patents on these subjects.

Ralph E. Dudley, Metallurgical Engineer, Bethlehem Steel Co., and active in ASTM Committee A-1 on Steel for many years, specifically in the field of rails and track fastenings, forgings, and steel wheels, recently retired from his long-time service with his company. A graduate of Missouri University in 1910, he was employed immediately afterwards with the old Cambria Steel Co., and thence joined the Bethlehem organization. He will continue to make his home at 35 West Greenwich St., Bethlehem, Pa.

Harvey R. Engle has been promoted to Works Chemist of the Works Laboratory, Hooker Electrochemical Co., Niagara Falls, N. Y., succeeding Burr H. Ritter, recently retired.

Lawrence Geyer, formerly Junior Engineer with the U. S. Department of the Army, is now associated with Marks Chemical Works, New York City, in the capacity of Chemical Engineer.

H. M. Hancock, until recently Superintendent, Inspection Div., Atlantic Refining Co., Philadelphia, Pa., is now Manager of the Product Control Dept. He is active in many phases of ASTM work.

Lynn N. Hokenson, formerly Container Development Engineer, Ohio Boxboard Co., Rittman, Ohio, is now Sales Representative, Fairfield Paper and Container Co., Columbus, Ohio.

George K. Iwashita has been appointed General Manager of the newly established

Commercial Products Department of the General Electric Company's Air Conditioning Division, Bloomfield, N. J. He was formerly Manager of Product Planning of the division. A member of a number of engineering groups, Mr. Iwashita is national program chairman and a director of the American Society of Refrigerating Engineers.

Jonathan Jones, long-time Chief Engineer of Fabricated Steel Construction, Bethlehem Steel Co., and previously for many years with the McClintic-Marshall Co., retired from this position on August 31. One of the outstanding authorities in the field of structural steel, he has been active for many years in ASTM, particularly in the work of Subcommittee II on Structural Steel of Committee A-1, where his knowledge and experience and counsel did much to establish and keep on a sound basis the widely used ASTM structural steel specifications. Recently he was honored by election to the Advisory Committee of A-1, and earlier the American Society of Civil Engineers had accorded him an honorary membership in recognition of his eminence in his field of work. Affiliated with ASTM since 1913, Mr. Jones has a wide circle of friends and admirers among both the producers and users of steel. He will continue to reside in Bethlehem, Pa.

W. W. Krauss is now Research Engineer, Process & Products Development Div., Truscon Steel Co., Long Island City, N. Y. Until recently he was with the Republic Steel Corp. in Cleveland, Ohio, in a similar capacity.

Stewart S. Kurtz, Jr., has been appointed Technical Associate in the Sun Oil Co.'s Research and Development Dept., Marcus Hook, Pa. He formerly was Manager of the company's Chemical Research Laboratory in Norwood, Pa.

Harry E. Lewis has been named Executive Director of the Industrial Mineral Wool Institute, with headquarters in New York City. He has taken an active interest in Institute affairs since 1941, being a member of its Technical Committee for a number of years. Mr. Lewis has previously held positions with the Great Lakes Carbon Corp., Perlite Div., Eagle-Picher Sales Co., and the Owens-Corning Fiberglas Corp.

John R. MacGregor, President, John R. MacGregor Lead Co., Chicago, Ill., and founding father and honorary member of the Federation of Paint and Varnish Production Clubs, will deliver the 1952 Mattiello Lecture at the Fall Convention of the Federation, to be held in Chicago in November. His topic will be "Unexplored Fields in Exterior Paints."

William E. Mahin, Director of Research, Armour Research Foundation of Illinois Institute of Technology, has been named to the Subcommittee on Aircraft Structural Materials of the NACA. He also is consultant to the Minerals & Metals Advisory Board of the National Research Council, and recently was elected chairman of the Chicago section of AIME.

John S. Marsh, Research Engineer, Bethlehem Steel Co., Bethlehem, Pa., has been awarded the American Iron & Steel Institute Medal.

Charles Maynard has been appointed Director of Engineering and Research, Indiana Steel Products Co., Valparaiso, Ind., this being one of four newly created offices in a company expansion program.

William F. Meggers, Chief of the Spectroscopy Section of the National Bureau of Standards, was honored at the Seventh Annual Meeting of the Society for Applied Spectroscopy, held in May, by presentation of the First Award of the Society, in recognition of his many contributions to this science.

Charles J. Nocar, for a number of years Director of Research and Development, E. F. Hauserman Co., Cleveland, Ohio, has been appointed to the newly created position of Assistant to the President of his company.

Frederick Ohrt, for 27 years Manager and Chief Engineer of the Board of Water Supply for the City and County of Honolulu, Hawaii, has retired to give full time to his responsibilities as a trustee of the Estate of James Campbell, one of the largest landowners in the territory. Mr. Ohrt has been representative of the Board's ASTM membership since 1934. Edward J. Morgan will succeed him on the Honolulu Board and as its representative in the Society.

Raymond C. Platow, formerly with Bell Telephone Laboratories, has joined the Research and Development Staff, U. S. Plywood Corp., New York City, as Chief Materials Engineer.

Walter H. Price has been appointed to succeed **Robert F. Blanks** as head of the U. S. Bureau of Reclamation's Engineering Laboratories in Denver, Colo. He has been a staff member of the laboratories since 1934.

Robert N. Repp, formerly with the Industrial Tape Corp., New Brunswick, N. J., is now associated with Coverdall & Colpitts, Consulting Engineers, New York City.

James M. Robertson has been named Chief Chemist, in charge of quality control at all plants of the Wellman Bronze & Aluminum Co., Cleveland, Ohio.

Bruno Sachs, of the Quiet-Heet Manufacturing Corp., Newark, N. J., and a member of the Society for a number of years, recently received his Ph.D. degree from Columbia University.

Robert G. Scott, formerly Chief Engineer for the Clay Products Assn., Chicago, Ill., has been appointed Vice-President and General Manager of that organization. He will continue to direct all engineering activities.

Foster Dee Snell, President, Foster D. Snell, Inc., New York City, received the 1952 Honor Scroll Award of the New York Chapter of the American Institute of Chemists, for outstanding contribution to his profession.

Frank G. Steinebach, Editor, *Foundry*, Cleveland, Ohio, received the John A. Penton Gold Medal at the 1952 "Foundry Show" of the American Foundrymen's Society, in recognition of outstanding contributions to this industry.

Steve Szczerbacki, until recently Instructor, Detroit Institute of Technology, has accepted a position as Source Assignment Engineer, Kansas City Aircraft Plant, Ford Motor Co.

Gordon Thompson, Chief Engineer, Electrical Testing Laboratories, Inc., New York City, recently received the degree of Doctor of Science from Moravian College, Bethlehem, Pa.

Werner von Bergen, Director, Research and Control Laboratories, Forstmann Woolen Co., Passaic, N. J., is slated to receive this November the Olney Medal of the American Association of Textile Chemists and Colorists, in recognition of his countless contributions to wool technology, and his vigorous, life-long championing of the cause of chemistry in the world's woolen industry. A native of Switzerland, and 1916 graduate of the Burgdorf Technical College, Dr. von Bergen, following experience as chemist with the Textile Printing Mills at Suhr, and the woolen mill of Pfenninger & Co. in Waedenswil, and as dyestuff technician at Bayer & Co., in Germany, came to U. S. in 1926 seeking broader professional experience, in the same year becoming the first chemist to be hired for the Garfield, N. J., plant of Forstmann Woolen Co. During his years of research both before and after joining Forstmann, he has made important contributions to wool technology.

In addition to projects of ASTM, where he heads Subcommittee A-3 on Wool and Its Products of Committee D-13 on Textile Materials, he has contributed much time and energy to programs of the National Research Council, the Department of Agriculture's Wool Advisory Committee, and the Textile Research Institute in Princeton, N. J.

A. Carl Weber, Director of Research and Engineering Sales for the Laclede Steel Co., St. Louis, Mo., was elected President of the Steel Joist Institute at its recent meeting in White Sulphur Springs.

Dr. Astin New Director National Bureau of Standards

DR. ALLEN V. ASTIN has been appointed Director of the National Bureau of Standards. Formerly Associate Director of the Bureau, Dr. Astin has been Acting Director since October, 1951. He has also been appointed a member of the National Advisory Committee for Aeronautics. A member of the Bureau's staff since 1932, he was until 1940 principally concerned with dielectrics and electronics. His contributions include development of improved methods for precise measurement of dielectric constants and power factors of dielectric materials and studies of the nature of energy losses in air capacitors. He did pioneering work in the development of radio telemetering techniques and instruments and applied this work to studies of cosmic rays and of meteorological problems in the earth's upper atmosphere.

In 1940 Dr. Astin was one of the Bureau scientists doing pioneering work in proximity fuze-research and development for bombs and rockets. He became chief of the Optical Fuze Section in 1943, assistant chief of the Ordnance Development Division in November, 1943, and chief of the Division in July, 1948. He played a major part in the development and evaluation of bar-type proximity bomb.

As chief of the Ordnance Division from 1948 to 1950, he supervised the Ordnance Laboratory, the Guided Missile Laboratories, and the Electronics and Tube Laboratories. When Dr. Astin was appointed Associate Director in May, 1950, he assumed responsibility for the work of the Ordnance Development, Missile Development, Electricity, and Electronics Divisions as well as the Office of Basic Instrumentation.

Dr. Astin was born in Salt Lake City, Utah, on June 12, 1904. He received the B.S. degree in physics from the University of Utah in 1925. While working toward his advanced degrees at New York University from 1925 to 1928, he was a graduate assistant and instructor in physics. From N.Y.U. he obtained the M.S. and Ph.D. degrees in physics in 1926 and 1928, respectively.

New Members . . .

The following 93 members were elected from July 1, to August 21, 1952, making the total membership 7256 . . . . Welcome to ASTM

Note—Names are arranged alphabetically—company members first then individuals.

Chicago District

ELECTRICAL UTILITIES Co., M. S. Hook, Chief Engineer, 2427 St. Vincents Ave., La Salle, Ill.

SOLLITT AND CO., SUMNER S., John G. Dempsey, Director, Concrete Div., 307 N. Michigan, Chicago 1, Ill.

JACOBSON, HENRY J., Chief Inspector, Grand Sheet Metal Products Co., 2501 W. Twenty-fourth St., Chicago 8, Ill.

SKARSHAUG, PAUL E., Owner, Skarshaug Testing Laboratory, 2812 Wood St., Ames, Iowa.

STEIN, J. STEWART, Partner, Sobel & Stein, 450 E. Ohio St., Chicago 11, Ill.

WHITESIDE, THOMAS M., Associate Research Engineer, Portland Cement Assn., 33 W. Grand Ave., Chicago 10, Ill.

WHITNEY, HERBERT W., Chief Metallurgist, Viking Pump Co., Cedar Falls, Iowa.

Cleveland District

PRECISION METAL MOLDING MAGAZINE, David Veit, Editor, 1240 Ontario St., Cleveland 13, Ohio.

Detroit District

ETCHELLS, E. B., Design Engineer on Engines, General Motors Corp., Chevrolet Div., General Motors Bldg., Detroit 2, Mich. For mail: 376 Wattles Rd., R2 Birmingham, Mich.

MOTTER, THEODORE J., Research Chemist, Libbey-Owens-Ford Glass Co., 1701 E. Broadway, Toledo, Ohio.

NAGLER, CHARLES ARTHUR, Vice-President, Metallurgical Consultants, Inc., 1016 Maccabees Bldg., Detroit 2, Mich.

SWIFT, HOWARD R., Research Supervisor, Libbey-Owens-Ford Glass Co., Technical Bldg., 1701 E. Broadway, Toledo 5, Ohio.

New England District

GENERAL ELECTRIC Co., Chemical Division, W. Goss, Manager, 1 Plastics Ave., Pittsfield, Mass.

BUFALINO, J. F., Treasurer and General Manager, Huse-Liberty Mica Co., 171 Camden St., Boston 18, Mass.

DANNENBERG, E. M., Section Head, Research and Development Dept., Godfrey L. Cabot, Inc., 77 Franklin St., Boston 11, Mass.

FISCHER, HERMAN C., Assistant Professor, Massachusetts Institute of Technology, Cambridge 39, Mass. For mail: 22 Fells Rd., Winchester, Mass.

MAYO, C. A., JR., Technical Manager, Bath Iron Works Corp., 700 Washington St., Bath, Me.

McCLINTOCK, Frank A., Assistant Professor of Mechanical Engineering, 1-314 Massachusetts Institute of Technology, Cambridge 39, Mass.

New York District

PITNEY-BOWES, INC., A. Burckhardt, Laboratory Supervisor, Walnut and Pacific Sts., Stamford, Conn.

VULCAN RUBBER PRODUCTS, INC., Edward W. McCarthy, Assistant Technical Director, Fifty-seventh St. and First Ave., Brooklyn 20, N. Y.

ALDRICH, JOSEPH J., Research Chemist, Chase Brass and Copper Co., Inc., 236 Grand St., Waterbury 20, Conn.

BIRDSALL, CLAUDE W., Civil Engineer, 1700 F St., Belmar, N. J.

FINELLI, JOSEPH P., Research Engineer, Stevens Institute of Technology, Hoboken, N. J. For mail: 339 E. Third St., Plainfield, N. J.

HIGGINS, B. J., Manager of Operations, Engineering, Sylvania Electric Products, Inc., Box 35, Hicksville, L. I., N. Y.

KOWALSKY, WILLIAM, Mechanical Engineer, Ramseyer & Miller, Inc., 11 W. Forty-second St., New York 36, N. Y.

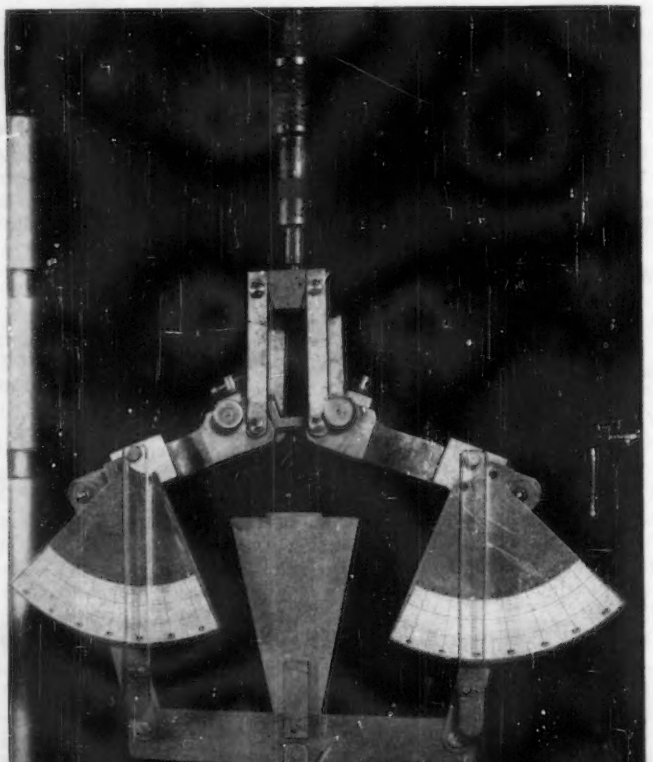
MACLEOD, JOHN A., Mechanical Engineer, Ebasco International Corp., 2 Rector St., New York, N. Y.

McGOWAN, JOSEPH N., Sales Engineer, Pennington Quarry Co., Pennington, N. J. For mail: 7 West St., Bordentown, N. J. [J]*

PRUGH, BYRON J., Assistant Chief Engineer, Moretrench Corp., 90 West St., New York 6, N. Y. For mail: 929 Harding St., Westfield, N. J.

ROBINSON, EDWARD A., Supervising Engineer, Seelye, Stevenson, Value & Knecht, 101 Park Ave., New York 17, N. Y. For Mail: The Ardsley, Garth Rd., Scarsdale, N. Y.

WILSON, MABEL F., Senior Chemist in Charge of Spectroscopy, Air Reduction Co., Research Lab., Murray Hill, N. J. For mail: 4 Hillside Ave., Summit, N. J.



Static Bend Ductility Testing Fixture

Honorable mention, General Photographs Section of the Eighth ASTM Photographic Exhibit, by Charles L. Caudill, Chance Vought Aircraft Div. of United Aircraft Corp.

Northern California District

ANDREASE, HOLGER, INC., Hugh Risoe, Manager, 703 Market St., San Francisco 3, Calif.

SAN FRANCISCO, CITY AND COUNTY OF, HETCH HETCHY PROJECT LIBRARY, H. E. Lloyd, Room 508, 425 Mason St., San Francisco 2, Calif.

VIBRADAMP CORP., Solomon Musikant, Chief Engineer, 2555 Lafayette St., Santa Clara, Calif.

YOSEMITE CHEMICAL CO., E. R. DeLew, Chief Chemist, 1040 Mariposa St., San Francisco 7, Calif.

Ohio Valley District

GREEGOR, RALPH H., Vice-President in Charge of Engineering, Kinnear Manufacturing Co., Columbus 16, Ohio.

LEE, WILLIAM M., Industrial Engineer, Keleket X-Ray Corp., 212 W. Fourth St., Covington, Ky.

MCMASTER, ROBERT C., Supervisor, Electrical Engineering Div., Battelle Memorial Institute, Columbus 1, Ohio.

SNYDER, W. G., Supervisor, Industry Standards, Reynolds Metals Co., 2500 S. Third St., Louisville 1, Ky.

Philadelphia District

LEHIGH MATERIALS CO., William F. Atkins, District Sales Manager, Lansford, Pa.

BACH, TILLMAN H., Planning Dept., Julian S. Slevin Co., Inc., Baltimore Pike and Hirst Ave., East Lansdowne, Pa. For mail: 6046 Carpenter St., Philadelphia 43, Pa. [J]

STEWART, F. L., General Manager, W. B. Coleman and Co., Ninth and Rising Sun Ave., Philadelphia 40, Pa.

Pittsburgh District

BACKSTROM, MELVIN L., Assistant Chief Engineer, Carbide Div., Firth-Sterling Steel and Carbide Co., 3313 Forbes St., Pittsburgh 30, Pa.

BEINLICH, J. J., Manager, Bureau of Technical Information, Research and Technology, United States Steel Co., Room 2421, 525 William Penn Place Bldg., Pittsburgh 30, Pa.

SCHREIBER, F. D., Manager, Coal Chemicals, Pittsburgh Coke and Chemical Co., Grant Bldg., Pittsburgh, Pa.

SMEATON, RONALD M., Superintendent, Coke Plant Research and Development, Clairton Works, United States Steel Co., Clairton, Pa.

TSE, SHOU-CHENG, Research Engineer, The Louthan Manufacturing Co., East Liverpool, Ohio.

MCGERVEY, WILLIAM P., President, Hanford Foundry Co., 119 S. Arrowhead Ave., San Bernardino, Calif. For mail: Box 192, San Bernardino, Calif.

Washington (D. C.) District

PHILIP MORRIS AND CO., LTD., INC., Robert N. DuPuis, Director of Research and Development, Box 1895, Richmond 15, Va.

STALFORT AND SONS, INC., JOHN C., Richard J. Kraus, Chemist, 319 W. Pratt St., Baltimore 1, Md.

AGRELLA, CHARLES J., Overseer, Control Lab., Dan River Mills, Danville, Va. For mail: 826 Melville Ave., Danville, Va.

DISE, JOHN R., Materials Engineer, National Bureau of Standards, Washington 25, D. C. For mail: 1510 Eighteenth St., N., Arlington 9, Va.

HOBBS, ROBERT B., Acting Chief, Paper Section, National Bureau of Standards, Washington 25, D. C.

HUTTON, A. K., Assistant Chief Metallurgist, Newport News Shipbuilding and Dry Dock Co., Newport News, Va.

KEE, WALTER ANDREW, Librarian, E. I. du Pont de Nemours and Co., Inc., Explosives Dept., Atomic Energy Div., Wilmington, Del.

LANE, ROBERT S., Mechanical Engineer, Pocahontas Fuel Co., Inc., Pocahontas, Va.

MANKOWICH, A. M., Chemist, Darlington, Md.

Western N. Y.-Ontario District

PURE CARBON CO., INC., Howard T. Hulburt, Electrical Test Engineer, 441 Hall Ave., St. Marys, Pa.

BATCHEN, R. F., Research Associate, Building Panel Div., Detroit Steel Products Co., 1210 Ferry St., Buffalo, N. Y. [J]

MADER, WILLIAM A., Chief Metallurgist, Oberdorfer Foundries, Thompson Rd., Syracuse, N. Y.

U. S. and Possessions

ISAACSON IRON WORKS, R. W. Hargis, Job Sales, Box 3028, Seattle 14, Wash.

LONG-BELL LUMBER CO., THE, Arthur L. Mottet, Research Director, Box 1079, Longview, Wash.

SUB TROPICAL TESTING SERVICE, C. Hubbard Davis, Owner and President, 3371 S. W. First Ave., Miami 45, Fla.

ALLEN, WILLIAM O., Quality Control, Julius Kayser & Co., Fountain Inn, S. C. For mail: Box 636, Fountain Inn, S. C. [J]

DICK, HOWARD C., Research and Vice President, Products Research Service, Inc., Box 126, Westwego, La.

GLANTZ, OMAR J., Engineer, U. S. Bureau of Reclamation, Denver Federal Center, Denver, Colo. For mail: 4949 Decatur St., Denver 11, Colo.

JOY, PAUL C., Assistant Production Superintendent, Honolulu Gas Co., Ltd., Box 3379, Honolulu 1, Hawaii.

LEE, SIDNEY, Chemical Engineer, Dallas Laboratories, 2500 Ervay St., Dallas, Tex.

MCCLELLAND, BRAMLETTE, Partner, Greer & McClelland, 2649 N. Main, Houston 9, Tex.

MILLER, EDWARD G., Metallurgist, Oak Ridge National Laboratory, Carbide and Carbon Chemicals Co., Box P, Oak Ridge, Tenn. For mail: 116 Everest Circle, Oak Ridge, Tenn.

NELSON, GEORGE H., General Manager, LBA Laboratories, Inc., Box 1558, Atlanta, Ga.

NORDMEYER, RUDY L., Secretary-Treasurer, Valley Brick and Tile Co., Mission, Tex. For mail: Box 353, Mission, Tex.

SOWERS, GEORGE F., Consulting Engineer, LBA Laboratories, Inc., Box 1558, Atlanta, Ga.

STORDALEN, KJELL N., Superintendent, Hard-board Div., Anacortes Veneer, Inc., Box 71, Anacortes, Wash.

U. S. BUREAU OF RECLAMATION, Technical Library, 209-A, Bldg., 53, Denver Federal Center, Denver, Colo.

WILLSON, CEDRIC, Vice-President and Chief Engineer, Texas Industries, Inc., 400 First National Bank Bldg., Dallas, Tex.

Other than U. S. Possessions

NEDERLANDSCHE STAALFABRIEKEN, v.h. J. M. De Muinck Keizer n.v., Utrecht, Holland.

CASTELLI, FRANCO, Manager, Steam Dept., Societa Edison, Via Ceresio 7, Milan, Italy.

ENGSTROM, BENGT A., Chemical Engineer, AB Gullhögens Bruk, Skövde, Sweden.

FARQUHARSON, A. G., Vice-President, Refining Dept., McColl-Frontenac Oil Co., Ltd., Royal Bank Bldg., Montreal 1, P. Q., Canada.

HALL, W. MILLER, Managing Director, Hall Machinery of Canada Ltd., Sherbrooke, P. Q., Canada. For mail: Box 773, Sherbrooke, P. Q., Canada.

KOCH, RENATO, Manager, Electronic Tubes Factory, Stabilimento Tubi Elettronici, Marconi, S.I.A.P., Via Pile, L'Auila, Italy.

LABORATORY DEPT., COMISION FEDERAL DE ELECTRICIDAD, S. C. Cisneros, Electrical and Mechanical Engineer, Rodano 14, Mexico 5, D. F., Mexico.

LAVOIE, JEAN-LOUIS, Highway Laboratory, Roads Dept., Parliament Bldgs., Quebec P. Q., Canada. For mail: 4 Parent Ave., Quebec, P. Q., Canada. [J]

LUDWIG, NIKOLAUS, Secretary, Fachnormenausschuss Materialpruefung, Cannstatt Str., 212, Stuttgart, Germany. For mail: Zieglergasse 16, Bad Cannstatt, Stuttgart, Germany.

MOHAMMAD KAHAN, IZHAR, Section Supervisor, Government Surgical Instruments and Allied Trades Development Centre, Sialkot, West Pakistan. [J]

NICHOLSON, C. M., Ceramic Engineer, American Nepheline, Ltd., Lakefield, Ont., Canada.

PEPIN, ROSAIRE, Chemical Engineer, Quebec Highway Laboratory, Parliament Bldg. E, Quebec, P. Q., Canada. For mail: 218 St. Valier St., Quebec, P. Q., Canada.

PORRO, AMILEARE, Chief Engineer, AERFER, Pomigliano d Arco, Naples, Italy. For mail: Aniello Falcone 292, Naples, Italy.

VANCOUVER PUBLIC LIBRARY, Main and Hastings Sts., Vancouver 4, B. C., Canada.

ZELDIS, LEON, Textile Engineer, Zeldis, S. A., Condell 1228, Valparaiso, Chile. For mail: Eleuterio Ramirez 477 6-A, Valparaiso, Chile. [J]

* J denotes Junior Members.

The 50th Anniversary Year is a good year to suggest names for Society Membership

---

To the ASTM Committee on Membership,
1916 Race St., Philadelphia 3, Pa.

Gentlemen:

Please send information on membership to the company or individual indicated below:

_____

_____

This company or individual is interested in the following subjects: indicate field of activity, that is, petroleum, steels, non-ferrous, etc,

_____

Signed_____

Date_____ **Address**_____

NECROLOGY . .

The death of the following members has been reported

O. F. Blakey, Professor of Mining and Engineering, School of Engineering and Mining, University of Western Australia, Perth, Western Australia. Representative of University membership since 1932.

Howard Cooper, Chief Lubrication Engineer and Manager of Technical Service, Sinclair Refining Co., New York City (June 27, 1952). Member since 1946, and active in Section on Lubricants for Air Compressors and Compressed Air Tools of Technical Committee on Lubricating Oils of Committee D-2 on Petroleum Products and Lubricants. A leader in the lubricating field, Mr. Cooper with his broad industry outlook had made important contributions to the program of the National Lubricating Grease Institute, serving terms as Director, Chairman of the Membership Committee, Vice-President and President. He had been associated with the Sinclair Co. in various capacities since 1922. He served in both World Wars, and from 1942 to 1945 was Chief of the Lubricants and Containers Section, Marketing Division of the PAW in Washington.

Colonel Wallace Charles Devereux, Managing Director, Almin, Ltd. (Associated Light Metal Industries), Farnham Royal, Buckinghamshire, England (June 21, 1952). Member since 1931. Widely known on both sides of the Atlantic in the aircraft and aluminum industries, and a familiar figure for many years in both industrial and government circles, Col. Devereux at the time of his death served on directing boards of International Alloys, Ltd., Southern Forge, Ltd., Warwick Production Co., Ltd., Structural & Mechanical Development Engineers, Ltd., Fulmer Research Institute, Renfrew Foundries, Ltd., and other organizations. He was founder of the Fulmer Research Institute at Stoke Poges, the first institute of its kind in England designed to carry out urgently needed research on a sponsored basis for individual companies. He had served as Superintendent of National Aircraft Factory No. 1 in World War I, and in the Ministry of Aircraft Production in World War II.

Harry J. Love, retired Secretary and Managing Director, National Slag Assn., Washington, D. C. (July 30, 1952). Active in ASTM from 1917 until his retirement in 1949, for many years as a personal member, also as representative of the National Slag Assn., Mr. Love rendered valued service in Committees C-9 on Concrete and Concrete Aggregates, and D-4 on Road and Paving Materials, the former group elevating him to honorary membership in 1949 in recognition of his contributions to its programs. A prime mover in the organization of the Slag Association in 1918, his efforts were instrumental in spreading the use of this then regarded waste by-product of the blast furnace until over 30 million tons of the aggregate is now used annually in the United States in concrete, highway construction, roofing and insulation. He was a member of the Highway Research Board, the National Press Club, and an honorary member of the American Trade Association Executives.

Claude L. McKesson, Research Consultant and retired Vice-President and Director of Engineering, American Bitumuls & Asphalt Co., Pasadena, Calif. (July 21, 1952). A member of the Society since 1930, Mr. McKesson had served on Committees D-4 on Road and Paving Materials, and D-18 on Soils for Engineering Purposes, and subgroups of both committees including the Joint D-4–D-18 Subcommittee on Tests and Specifications for Stabilized Soils.

Alfred Peter Poorman, Professor of Applied Mechanics, Purdue University, West Lafayette, Ind. (February 12, 1952). Member since 1908. A member of the faculty of Purdue University since 1909, except for a period of two years (1917–19) when he was serving as Captain, Engineer Corps, U. S. Army, Dr. Poorman was an authority in the field of applied mechanics and strength of materials.

Edmund A. Reilly, Chief Chemist, Philadelphia & Reading Coal & Iron Co., Pottsville, Pa. (August 2, 1952). Member since 1925.

Vic Sanders, Engineer, Pittsburgh Corning Corp., Pittsburgh, Pa. (June 20, 1952). Affiliated with the Society since 1945, for some years as representative of his company membership, and more recently as a personal member, Mr. Sanders had served on Committee C-16 on Thermal Insulating Materials and its Subcommittee on Block and Pipe Insulation. He had also been a member of the Pittsburgh District Council since 1950.

Paul H. Smith, Engineer of Tests, Chicago, Burlington & Quincy Railroad Co., Aurora, Ill. (August 17, 1952). A member of the Society since 1947, Mr. Smith had taken an active part in the work of Committee A-1 on Steel and its subgroups concerned with spring steel, forgings, pipe and tubing, and bar steels.

George B. Waterhouse, Consulting Engineer and Metallurgist; and Professor of Metallurgy, Emeritus, Massachusetts Institute of Technology, Cambridge, Mass. (May 10, 1952). Affiliated with ASTM since 1922, Dr. Waterhouse had served through the years on many technical groups, principally Committees A-1 on Steel, A-10 on Iron-Chromium, Iron-Chromium-Nickel and Related Alloys, and E-8 on Nomenclature and Definitions. A member of numerous scientific societies, he was President of the American Society for Metals in 1937, and a director and trustee of that group at different times. He had distinguished himself by his research work in iron and steels during the 1930's, and was the 1933 Howe Memorial Lecturer. Dr. Waterhouse was a lieutenant in the 74th Regiment, N. Y. National Guard, in World War I, and served on several important Government advisory groups during War II.

ISO Plastics Group to Meet in Turin

A three-day meeting of ISO/TC 61 on Plastics will be held October 2, 3, and 4, 1952, in Turin, Italy. Scheduled in addition to plenary sessions are meetings of working groups on chemical properties, strength properties, laboratory atmospheres and conditioning procedures, thermal properties, and equivalent terms.

So far the following are scheduled to attend the sessions as the official American delegation: W. A. Zinzow, Bakelite Div. of Union Carbide and Carbon Corp.; G. M. Kline, National Bureau of Standards; G. P. Mack, Advance Solvents and Chemical Corp.; Carl Negy, General Die Mold Co.; Islyn Thomas, Newark Die Co.; C. K. White, Hercules Powder Co.; and E. B. Cooper, E. I. du Pont de Nemours & Co. A number of others from this country have indicated they may be able to attend.

Messrs Kline, Zinzow, and Cooper are all active members of ASTM Committee D-20 on Plastics.

Inquiries concerning the "Advantages of Membership" will be welcomed during the Society's 50th Anniversary Year

To the ASTM Committee on Membership
1916 Race St., Philadelphia 3, Pa.

Gentlemen:

Please send me information on Membership in ASTM and include a membership application blank.

Signed_____
Address_____

Date_____

NEWS NOTES ON

Laboratory Supplies and Testing Equipment

Instrument Notes

Melting Point and Temperature Instrument—Temperature-optical transmission studies and automatic determination of melting point, solidification point, softening point, dehydration point, decomposition point, etc., can be accomplished rapidly, accurately, and reproducibly by means of the new Aminco-Furst Meltometer, according to the manufacturer. It is stated that the instrument performs many determinations automatically, minimizes personal error, and reduces the variables of the determination to reproducible constants. Transmission and temperature of the sample are indicated or recorded continuously. A maximum of 15 min. is said to be required for making a melting point determination, with only 1 min. said to be required for the operator to insert the sample and set the controls. Only microscopic amounts of sample are required for test. Upon completion of a test, the sample is in a solid state for observation, storage, or repeated tests. The maximum range of the "Meltometer" is 0 C to 500 C, and its accuracy is said to be 1 per cent of the pyrometer scale. For increased accuracy, reduced temperature ranges, with zero suppression, can be selected. Details are given in Bulletin 2205-31.

American Instrument Co., Inc., Silver Spring, Md.

Air Powered Stirrer—A new stirrer called the "Arrow Air Stirrer," completely powered by air, has been introduced. This unit is designed specially for the more viscous materials in such fields as solvents, lacquers, paints, oils, synthetics, fine chemicals, and heavy chemicals. According to the manufacturer, after field tests, the unit has been enthusiastically received by many of the leading industrial laboratories. Air supply of 35 to 100 lb is used to power this 7–1 air ratio motor at speeds of from 50 rpm to 1200 rpm. The air motor is rated at $^1/_8$ hp at 80 lb. The unit weighs 4 lb 5 oz. The 12-in. long shaft and 2½-in. diameter propeller are stainless steel and are said to be resistant to most acids and chemicals.

Arrow Engineering Co., Inc., Hillside, N. J.

Ultrasonic Micrometer—Ultrasonic thickness measurements can now be made with a precision substantially higher than has previously been possible by this method, using the new "Audiogage" ultrasonic micrometer, according to the manufacturer, Branson Instruments, Inc. Measurements consistently within ½ of 1 per cent of actual thickness are said to have been obtained from one side of materials with smooth surfaces. The "Audiogage" ultrasonic micrometer can be used on homogeneous materials such as steel, brass, aluminum, copper, glass, lucite, and other dense substances capable of transmitting the ultrasonic waves generated by a vibrating crystal. The unit measures thickness by determining the frequency at which unit resonance of the high-frequency sound waves occurs in the materials under test. Resonance is indicated by maximum deflection of a meter and maximum strength of a tone audible in the headphones. Since accuracy, rather than rough checking, is the primary objective of the ultrasonic micrometer, it is designed to operate with high precision over an infinite series of relatively narrow thickness ranges between 0.010 and 12 in.

Branson Instruments, Inc., 430 Fairfield Ave., Stamford, Conn.

Surface Comparator—Greater flexibility in use, increased portability, and more pleasing appearance are claimed for the new Faxfilm Surface Comparator, Model BL-122, now being introduced by The Brush Development Co. Faxfilm is the method of surface study in which a clear plastic replica of a surface is made and projected in a microprojector to show details of surface condition with three-dimensional effect. The new unit provides comparison of work specimens with standard finishes in surface roughness inspection, the comparison of finishes obtained in machinability studies, and comparisons of surface changes in wear and life tests.

Brush Development Co., Instrument Div., 64G, 3405 Perkins Ave., Cleveland 14, Ohio.

Consistency Measuring Unit—A new consistometer is designed to measure the consistency of viscous materials by timing the flow over a measured course. Though this instrument was originally developed for use in the canning industry with such products as tomato catsup, jams, preserves, etc., it is said to be equally valuable in working with many other viscous materials. Called the "Cenco-Bostwick" Consistometer, the unit is constructed of a graduated, rectangular, monel-metal trough divided about 2 in. from one end into two sections by a vertical action gate. The gate is spring operated and held down by an L-shaped trigger which releases it instantaneously. The larger section of the trough is graduated on the bottom in divisions of 0.5 cm. In use the smaller compartment is filled with the substance to be measured. When the gate is released the sample flows into the graduated section and the distance it travels over a period of one minute is noted. As the moving edge of flow of viscous materials is not uniform, both maximum and minimum distances are measured and an average taken of the two extremes. This average may be used to represent the mean consistency of the product.

Central Scientific Co., 1700 Irving Park Rd., Chicago 13, Ill.

Oscillography Accessory—A new illuminated calibrated scale kit for users of cathode-ray oscillographs who wish to bring their equipment up to date has been announced. The kit, designated as Type 2562, facilitates amplitude and time calibration for both visual and photographic applications. It is designed to fit any 5-in. cathode-ray oscillograph with the standard Du Mont Type 2501 Bezel and is especially useful under darkened room conditions or under a camera hood where a scale without illumination is difficult to discern. The new kit consists of four incandescent bayonet type lamps with sockets, a bezel, front and rear masks, a plastic rectangular-coordinate calibrated-scale, and a color filter.

Allen B. Du Mont Laboratories, Inc., 750 Bloomfield Ave., Clifton, N. J.

Terminal Adapter for Oscillographs—A new terminal adapter which increases flexibility of connections to cathode-ray oscillographs has been announced. The adapter, designated as the Type 2592-Terminal Adapter, permits easier use of coaxial cables for carrying signals to the banana-jack type terminals of cathode-ray oscillographs and other test equipment and also provides correct impedance-matching termination for the coaxial cables.

Allen B. Du Mont Laboratories, Inc., Instrument Div., 750 Bloomfield Ave., Clifton, N. J.

Electro-Analyzer—According to the manufacturer, laboratories that make use of electroanalysis can achieve a here ofore unattainable flexibility, speed, and convenience with the new Fisher Electro-Analyzer. The unit (available in two-spindle and four-spindle models) makes it possible to run separate (or duplicate) analyses at the same time. In both models, each spindle or station is equipped with its own independent components—permitting flexibility of schedule. The unit offers 10 v at 10 amp. Alternating current ripple (a shortcoming in earlier instruments) is said to be held to less than 2 per cent. The unit also features a 200-w thermostated sample heater.

Fisher Scientific Co., 717 Forbes St., Pittsburgh 19, Pa.

Silent Blast Burner—Shouting distance in the laboratory doesn't mean any distance over 6 in. when the blast burner in use is a Fisher-Todd, according to the manufacturer. It is said to operate quietly, almost silently—with no disturbing roar—because there is pre-mixing of the gases within the burner prior to external combustion. The new burners were redesigned with one-piece gas and oxygen entering chambers. Thus the danger of leaks is minimized. Any one of four basic working flames can be had with Fisher-Todd Blast Burners. Simple valve adjustments by the operator produce small or large scaling flames, small or large annealing flames. And each of these

flames is instantly available, without changing tips, merely by adjusting gas and oxygen valves. A pilot flame keeps the burner ready for use. There are two models of Fisher-Todd Blast Burners. The "standard Blast" furnishes a strong, high-temperature flame which is suited for heavy-duty heating operations, ranging from crucible ignitions, ore fusings to coke button tests. The "Master Blast" has many of the Standard Blast's features, but it is larger, more powerful and versatile.

Fisher Scientific Co., 717 Forbes St., Pittsburgh 19, Pa.

D-C Chopper Amplifier—A new d-c chopper amplifier with many unusual features and broad applications is announced by Keithley Instruments. Designated the Model 300 Universal Chopper Amplifier, it has a maximum gain of 800,000, frequency response of 0–500 cps, input impedance of 1 megohm, noise and drift within 25 mv, or 2 per cent of full-scale output. Other features of the Universal Amplifier include stabilized gain and a new mechanical chopper with a rate of 5000 contacts per sec. The input bucking potential includes both step and continuous controls, and allows the zero to be offset 150 times full scale. Any pen recorder can be used with the new instrument to indicate the small potentials developed by thermocouples, strain gages, and other sources in which the d-c and a-c components are of equal interest. Output of the Universal Amplifier will deliver up to 25 ma, and can develop ±80 v.

Keithley Instrument, 3868 Carnegie Ave., Cleveland 15, Ohio.

Electric Closed Cup Flash Tester—An electrically heated Closed Cup Tester for flash and fire point determinations of volatile, flammable liquids flashing below 175 F, said to be in accordance with ASTM Method D 56[1], has been announced. This instrument, it is claimed, represents a notable improvement over the gas or alcohol heated devices currently used. Advantages stated for the electric flash tester are: greater accuracy of temperature control, achieved by the "Handi-Hot Plate" heater; wide heater temperature range (from 100 F to 700 F); and greater safety, since the only open flame present is that used to create the flash. The hot plate is provided with a metal collar which supports a water bath in which the standard oil cup is suspended. The oil cup cover is equipped with the specified flashing mechanism. The flash burner has a gas tip which may be provided with an oil wick if desired. Pressing the handle on the cover mechanism automatically opens the port and introduces the flash flame into the oil cup. The Closed Cup Tester is of stainless steel and brass; the hot plate and support collar are steel with a heat- and corrosion-resistant baked enamel finish.

Precision Scientific Co., 3737 W. Cortland St., Chicago 47, Ill.

Adjustable Stem Thermometer—The development of a new adjustable stem thermometer called "Adjustatherm," made in two different stem lengths, 6½ and 11½ in., has been announced. Both sizes are available in three ranges: 0 to 150 C, 0 to 250 C, and 0 to 360 C. It is claimed that a set of two "Adjustatherms" will replace up to nine conventional type thermometers. It is further claimed that in addition to taking the liquid temperature, you may also obtain the vapor temperature without dismantling the equipment, by simply lifting up the thermometer. The "Adjustatherm," which works like a trombone, consists of a thermometer and a precision bore sleeve (or adapter) with either a standard taper or semiball joint.

Scientific Glass Apparatus Co., Inc., Bloomfield, N. J.

Abrasion Tester for Cylindrical Parts—Recently announced is a new abrasion testing machine for rating the wear resistance of protective finishes, that is, black oxidized or electroplated coatings, extruded plastic and enamel applied to aircraft, ordnance and metal furniture tubing, and other cylindrical parts or test pieces. This Model No. W-3981 Cylinder Abrasion Tester is adjustable to take cylindrical specimens from ½ to 6 in. in diameter and 8 to 36 in. in length. The width of the wear track is normally 1 in., however, the face of the abrading medium can be narrowed to wear a track only ½ in. in width, where required. The abrasion resistance is reported as "the number of wear cycles" the surface will withstand before penetration of the protective finish permits corrosion to take place. The end point for corrosion resistance is determined with an indicator solution, however, a visual end point can also be used by comparing with a standard. The wear cycles are indicated by an electric counter at the left of the operator. One wear cycle is one complete revolution of the abradant wheel.

Taber Instrument Corp., 102 Goundry St., North Tonawanda, N. Y.

Altitude Test Chambers—A standard line of altitude chambers designed to cover the majority of all altitude test requirements has been announced. The move enables purchasers to select altitude chambers from existing specifications and avoid the extra cost of custom-built units. Known as the "TenneyZphere," the chambers provide vacuum conditions simulating altitudes from sea level to approximately 80,000 ft. In addition to simulated altitude conditions, the TenneyZphere also creates high and low temperatures and variable relative humidity conditions. Temperatures range from 200 to −100 F. Relative humidities are from 20 to 95 per cent. Temperature recording controls, pressure controller, and altitude gage or mercury manometer are standard equipment. All controls are mounted on the chamber for ease of operation and adjustment to different conditions.

Tenney Engineering, Inc., 26 Avenue B, Newark 5, N. J.

Catalogs and Literature

Specimen Cut-Off Machines—This folder describes the complete Buehler line of cut-off machines. Five models are available for samples from ½ in. diameter to 3 in. diameter.

Buehler Ltd., 165 W. Wacker Dr., Chicago 1, Ill.

Carrier Amplifier—A bulletin just issued describes Consolidated Engineering Corp.'s Type 1-118 Carrier Amplifier which is designed primarily for the smaller engineering and development laboratory not having a full-time staff devoted exclusively to testing. The simplicity and flexibility of this instrument are said to recommend it particularly for this usage. It is of special interest to engineers engaged in development of high-speed industrial equipment for it greatly simplifies analysis and evaluation of all the high-frequency and transient physical factors affecting product performance. All components of the 4-channel system are contained in one compact cabinet. The great number of commercially available pickups satisfactory for use with the 1-118, permit measurement of physical phenomena such as stress, strain, vibration, acceleration, temperature, displacement, torque, pressure, etc. *Bulletin CEC 1522A*

Consolidated Engineering Corp., 300 N. Sierra Madre Villa, Pasadena 8, Calif.

Vibration Meter—Recently issued is a new four-page bulletin describing the 1-110B Vibration Meter, a simple and compact instrument giving direct readings of both linear and torsional velocity and displacement, allowing rapid, easy calculation of the vibrational characteristics of machines and structures. Although used by test engineers for vibration studies—one of its applications is in turbo-jet engine acceptance tests. The instrument is portable, simple to use and its operation does not demand highly experienced personnel it is claimed. Five ranges of sensitivity allow the meter's full-scale deflection to represent from 0.0005 to 0.5 in. peak-to-peak vibratory displacement. Two pickups can be connected to the Vibration Meter at one time, with a front-panel switch allowing instant switching from one to the other channel.

Consolidated Engineering Corp., 300 N. Sierra Madre Villa, Pasadena 8, Calif.

Admittance Meter—A new bulletin describing the General Radio Admittance Meter has been published by the manufacturer. This device is a simple and accurate means of making impedance measurements in the VHF and UHF ranges from 50 to 1500 mc.

General Radio Co., 275 Mass. Ave., Cambridge 39, Mass.

X-Ray Spectrometry—A new four-page folder titled "X-Ray Techniques Can Help You Solve Your Materials Problems," is available. The folder contains a technical article from a national trade publication that describes X-Ray spectrometry with automatic chart recording. Illustrated with drawings, charts, and photos, the folder presents details concerning operating principles and uses of this technique.

Research & Control Instruments Div., North American Philips Co., 750 S. Fulton Ave., Mount Vernon, N. Y.

Instruments and Chemicals for Radioisotope Applications—A new two-color Condensed Catalog listing latest instruments and radiochemicals for radioisotope applications in the medical, educational, industrial, and research fields supplied by the Nuclear Instrument & Chemical Corp. is now available. Among the new products listed in the Condensed Catalog are: The "Cloudmaster," a low-cost diffusion cloud chamber which allows radioisotope disintegration to be seen; the "Isotron," a new instrument for the clinical measurement of I^{131} in brain tumor studies; the "Hand and Foot" counter, a completely automatic monitor for detecting and indicating the degree of contamination on the hands and shoe soles of radiolaboratory personnel; and the latest list and prices of the firm's Carbon 14 radiolabeled chemical compounds.

Nuclear Instrument & Chemical Corp., 223 W. Erie St., Chicago 10, Ill.

[1] ASTM Method of Test for Flash Point by Tag Closed Tester, D 56–51, 1951 Supplement to 1949 Book of ASTM Standards, Part 4, p. 56; Part 5, p. 91.

Combustion Bombs—Recently issued is a new 16-page illustrated price list covering complete assemblies and replacement parts for all Parr combustion bombs and calorimeters. *Price List No. 52-1.*
Parr Instrument Co., Moline, Ill.

News of Commercial Testing and Research Laboratories

Association of Consulting Chemists and Chemical Engineers, Inc., New York, N. Y., has published an extensive brochure entitled "The Consulting Chemist and Chemical Engineer in a World Economy." A general discussion is given of such matters as consultant's services, specializations, choosing a consultant, and advantages in using the consultant's services. A major portion of the publication is devoted to case histories of services being performed by the independent laboratory. In this section 38 specific projects are described in such widely varying fields as furs, sugar refining, cosmetics, and steel cartridge cases.

J. B. Calva & Co., Minneapolis, Minn.—A new method for odorization of LPG, Bulletin G-5, may be obtained in writing to J. B. Calva & Co., research engineers, Kasota Bldg., Minneapolis 1, Minn. Developed by the company, this is a matter of importance bearing on the safety of the use of liquefied petroleum gases.

The Chicago Testing Laboratory, Chicago, Ill.—Announcement is made of the formation of a Specialties Division for the purpose of extending the scope of its activities. Housed in a new laboratory adjacent to the main laboratory, this Division will undertake problems relating to pulp, paper, paperboard, metal foils, plastic films, foodstuffs packaging, and chemicals used in papermaking and converting operations. Routine testing and control and development problems will be within the scope of the laboratory's activities. The equipment includes a constant temperature and humidity conditioning room and most of the specialized apparatus required to test papers, by methods standardized by TAPPI, ASTM, and Federal Specifications.

Commercial Testing and Engineering Co., Chicago, Ill.—This company announces the recent moving of its main offices from 307 N. Michigan Ave., Chicago 1, Ill., to new and larger quarters in the Builders Bldg., 228 N. LaSalle St., Chicago 1, Ill. Also announced is the recent purchase and occupancy by their branch office at Charleston, W. Va., of a building located at Broad and Piedmont Sts., Charleston, W. Va. The building which was purchased will afford additional space and greatly facilitate the operations at that office.

W. J. Cotton Laboratories, Milwaukee, Wis.—A small folder has been issued picturing the facilities of its organization and describing clients served.

Raymond C. Crippen Research and Development Laboratories, Baltimore, Md.—A price list covering chemical tests, bacteriological, comprehensive tests, and physical tests performed by this organization in research and analysis of water, has recently been issued

Electrical Testing Laboratories, Inc., New York, N. Y.—"ETL Notes," a publication issued at intervals by the Electrical Testing Laboratories, Inc., features in its latest issue, items dealing with the independent testing laboratory's function in quality control; certification by Electrical Testing Laboratories of testing equipment; and sound insulation qualities of construction materials. The lead article points out that the independent testing laboratory can make a threefold contribution in the field of quality control. First, as a source for primary standards, second, as an agency for insuring the accuracy of test equipment used in production plants, and third, as the representative of top management in making independent periodic determinations of the status of quality.

Ledoux & Co., New York, N. Y.—This company is building new laboratories and offices at 359 Alfred Ave., Teaneck, N. J. and plans to move about October 1. The location is less than four miles from the New Jersey end of the George Washington Bridge, about 100 ft north of Route 4 from which it can be seen clearly. The new plant will have more than double the present floor space and the company hopes to broaden its scope so that all these facilities will be employed.

Oklahoma Testing Laboratories, Oklahoma City—The address of Oklahoma Testing Laboratories has been changed to 310 N. Klein St., P.O. Drawer 3838. The laboratory continues to be located at the corner of Northwest Second and Klein but now has a new address.

Foster D. Snell, Inc., New York, N. Y.—Foster Dee Snell, Consulting Chemist, has of been elected a Fellow of the Royal Society Arts in London.

Instrument Company News

Baird Associates, Inc., Cambridge, Mass.—William W. Garth, Jr., has been elected to the Board of Directors. Mr. Garth is President and Treasurer of Photon, Inc.; among other activities he is an executive of the Graphic Arts Research Foundation, Inc., Chemical Products Corp., and New England Lacquer Co. He was educated at MIT and studied law at Northeastern University.

Fish-Schurman Corp., New Rochelle, N. Y.—Announcement is made of a new plant of the Jena Glass Works Schott & Gen. Aided by capital from the United States under the Marshall Plan, a new plant has been erected near Mainz, Germany. Recently the opening of the first section was attended by American, French, and German officials. The section of the plant now in operation was built in ten months; when the entire plant is completed, 4000 people will be employed. Designed along modern lines and furnished with the most advanced equipment, the new plant will enable Schott & Gen. greatly to increase production of fine optical glass. Jena Optical Glass is sold in the United States by the Fish-Schurman Corp.

Radiation Counter Laboratories, Inc., Skokie, Ill.—C. Gilbert Goss, Development Engineer in Electronic Circuitry at Oak Ridge National Laboratory for the past four and one-half years, has joined the firm as Director of Electronic Research.

Specialized Instruments Corp., Belmont, Calif.—Frank Pearson, designer and manufacturer of electrophoresis apparatus, has joined the staff as project manager. Formerly associated with the Technicolor Motion Picture Corp. as an optical specialist, he has also been in the special effects department of the Walt Disney Studio.

Syntron Co., Homer City, Pa.—These manufacturers of vibratory material handling equipment, portable power tools, diesel pile hammers, selenium rectifiers, shaft seals, paper joggers, etc., have organized a Canadian subsidiary, Syntron Ltd., and purchased a manufacturing plant in Stoney Creek (Hamilton area), Ontario, Canada. Syntron Co. has disclosed that selenium rectifiers will be the first item to go into production, although ultimately, the entire line will be manufactured in the Stoney Creek plant. It is expected that production will start sometime in September or October, 1952.

Calendar of Other Society Events

"Long" and "short" calendars will appear in alternate BULLETINS. The "short" calendar notes meetings in the few immediate weeks ahead—the "long" calendar for months ahead.

NATIONAL ASSOCIATION OF CORROSION ENGINEERS—Oct. 1–3, South Central Region, New Orleans, La.
SOCIETY OF AUTOMOTIVE ENGINEERS—Oct. 1–4, National Aeronautic Meeting, Los Angeles, Calif.
AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS—Oct. 13–17, Fall General Meeting, New Orleans, La.
AMERICAN CERAMIC SOCIETY—Oct. 16–18, Pacific Coast Regional Meeting, Olympic Hotel, Seattle, Wash.
THE NATIONAL INSTITUTE OF GOVERNMENTAL PURCHASING—Oct. 19–22, Seventh Annual Conference and Products Exhibit, Edgewater Beach Hotel, Chicago, Ill.
AMERICAN INSTITUTE OF MINING & METALLURGICAL ENGINEERS—Oct. 20–24, Fall Technical Session, Philadelphia, Pa.
NATIONAL METAL CONGRESS AND EXPOSITION-AMERICAN SOCIETY FOR METALS—Oct. 20–24, Convention Hall, Philadelphia, Pa.
AMERICAN WELDING SOCIETY—Oct. 20–24, Philadelphia, Pa.
NATIONAL RESEARCH COUNCIL—Oct. 24–25, Chemical-Biological Correlation Symposium, Washington, D. C.
ASSOCIATION OF CONSULTING CHEMISTS AND CHEMICAL ENGINEERS, INC.—Oct. 28, Annual Symposium, Hotel Belmont Plaza, New York, N. Y.
AMERICAN CHEMICAL SOCIETY—Oct. 29–31, Fall Meeting, Division of Rubber Chemistry, Hotel Statler, Buffalo, N. Y.
AMERICAN SOCIETY OF MECHANICAL ENGINEERS—Oct. 30–31, Fuels 15th National Conference, Philadelphia, Pa.
SOCIETY OF AUTOMOTIVE ENGINEERS—Oct. 30–31, National Diesel Engine Meeting, St. Louis, Mo.
SCIENTIFIC APPARATUS MAKERS ASSOCIATION—Nov. 5–9, Midyear Meeting of Industrial Instrument, Laboratory Apparatus, Laboratory Equipment, Optical Aeronautical and Military Instruments Sections, The Homestead, Hot Springs, Va.
SOCIETY OF NAVAL ARCHITECTS AND MARINE ENGINEERS—Nov. 12–15, 60th Annual Meeting, Waldorf-Astoria, New York, N. Y.
AMERICAN STANDARDS ASSOCIATION—Nov. 19, 34th Annual Meeting, Waldorf-Astoria, New York, N. Y.
AMERICAN PHYSICS SOCIETY—Nov. 28–29, Washington University, St. Louis, Mo.
AMERICAN SOCIETY OF MECHANICAL ENGINEERS—Nov. 30–Dec. 5, Annual Meeting, Statler Hotel, New York, N. Y.

BOOK REVIEWS . . .

Air Pollution

AT THE direction of the President of the United States, the Secretary of the Interior established in 1950 the Interdepartmental Committee on Air Pollution which in turn sponsored a United States Technical Conference on Air Pollution. This Interdepartmental Committee was under the chairmanship of Dr. Louis C. McCabe, Chief Fuels and Explosives Division, Bureau of Mines, U. S. Department of the Interior. Dr. McCabe also serves as the chairman of ASTM Committee D-22 on Methods of Atmospheric Sampling and Analysis. The Interdepartmental Committee was made up of representatives from the Departments of the Interior, Army, Agriculture, Air Force, Navy, Commerce; the Federal Security Agency, Atomic Energy Commission, and Office of the Secretary of Defense. Also invited to participate in the conference were outstanding professional men working on various aspects of the problem in universities, research foundations, and industry.

The conference was held in Washington, May 3 to 5, 1950, and the proceedings of this meeting have been published by McGraw-Hill Book Co., Inc. The conference (and consequently the book) was divided into the following seven panels:

Agriculture
Analytical Methods and Properties
Equipment
Health
Instrumentation
Legislation
Meteorology

Dr. McCabe in the preface to this book states, "The purpose of this volume is to bring together in one volume an authentic body of information on the nature and control of air pollution. The subject is not new and there are many examples in years past of the successful application of the scientific method to specific atmospheric contamination problems. Nevertheless the writings on the subject are scattered and are more apt to reflect facets than a systematic appreciation of the subject matter."

This 97-chapter, 860-page book covers many phases of the air pollution problem ranging from the economic aspect, effect on plants and other life, and the effects of air pollution in Donora, Pa., to a discussion of sampling and instrumentation, legislation, and the diffusion problem in Oak Ridge, Tenn.

This book is graphically and photographically illustrated and is available from the McGraw-Hill Co., Inc., 330 W. 42nd St., New York 36, N. Y., at the price of $12.50.

Heating, Ventilating, Air Conditioning Guide for 1952

A REVIEW of the 1952 edition of the Heating, Ventilating, and Air Conditioning Guide, published annually by the American Society of Heating and Ventilating Engineers, discloses an increase both in usefulness and size of this guide, with 32 additional pages and new data added which contain technical and design information on 50 subjects.

The latest editions of all codes of interest have been included, together with new codes not previously shown. A larger catalog data section is contained for obtaining data and specifications on the latest products of manufacturers. The chapter arrangement of the past two editions has been retained. These chapter titles are Fundamentals, Human Reactions, Heating and Cooling Loads, Combustion and Consumption of Fuels, Systems and Equipment, Special Systems, and Instruments and Codes.

Copies of the volume, priced at $7.50 each, are available through ASHVE Headquarters, 62 Worth St., New York, N. Y.

Performance of Lubricating Oils

THE author of this American Chemical Society Monograph, ASTM member H. H. Zuidema, Shell Oil Co., has assembled in a single volume the salient features of the performance of lubricating oils in various applications and under various conditions.

To insure that the book will not suffer speedy obsolescence, the material has been organized on the basis of performance characteristics such as oxidation, corrosion, wear, etc., rather than from the standpoint of application, for example, motor oil, gear oil, aircraft oil, etc.

From this basic approach the author has formulated chapters on Rheology, Oxidation, Bearing Corrosion, Sludge and Lacquer Deposition, Emulsification and Foaming, Wear, and Manufacturing Methods. Appended to each chapter is an extensive bibliography of technical papers pertaining to the chapter topic.

Copies of this compact and well-illustrated volume which should be of great value to men concerned with the development, manufacture, and use of lubricating oils, can be obtained from the Reinhold Publishing Corp., 330 W. 42 St., New York City; price $5.

Corrosion Testing Procedures

THIS 369-page book by F. A. Champion, Beaconsfield, England, has been published recently by John Wiley & Sons, 440 Fourth Ave., New York, N. Y.

Champion has divided his book into five stages as follows:

1. The choice and preparation of metal and corrosive.
2. Exposure of the metal to the environment in laboratory, field, or service tests.
3. Cleaning of the specimens preparatory to examination.
4. Examination of the specimens or the corrosive for the effects of corrosion: other measurements which indicate the tendency to corrode rather than the effects of corrosion, and special tests, are considered separately.
5. The expression and interpretation of results, with particular reference to the form of the corrosion time curve.

The author then proceeds to give various alternative procedures for each stage. The book contains many references; in some of the 12 chapters there are as many as 129 references not only to papers by English and European authors, but also to many American writers well known in the corrosion field. There are numerous line drawings and photographs, particularly in the sections on Laboratory Exposure Conditions, Laboratory Conditions for Conjoint Action.

This book is available from John Wiley & Sons at the price of $6.25.

Safety Standards Pamphlet Published by ASA

A BOOKLET containing an up-to-date numerical list of American Safety Standards, both approved and under development, has just been published by the American Standards Association. Each listing carries a brief commentary on the standard—giving its scope and the requirements or recommendations specified. A new and useful feature of this revised document is a comprehensive subject index, alphabetically arranged. The index sets forth in detail the variety of subjects covered in all of the standards and constitutes a timesaver in the selection of the appropriate standard for any given subject.

Nearly all of the 160 American Safety Standards listed are widely used in industry, and some of them have been adopted as a basic part of municipal, state, or federal regulations. The National Electrical Code, for example—an approved American Safety Standard, developed under the sponsorship of the National Fire Protection Association—has been used in whole or in part in the legal enactments of 716 municipalities.

As the pamphlet states, "The success of American Safety Standards is due in large part to the fact that they have always been developed by the people who know them best and use them most. The provisions included in the standards represent a crystallization of the accumulated wisdom of long industrial experience. They constitute a symposium of the best methods of meeting the technical problems of safety. Because of these factors, industry has voluntarily adopted the standards and used them widely."

Copies of the pamphlet, "American Safety Standards," PM 87.1, are available without charge from the American Standards Assn., 70 E. 45 St., New York 17, N. Y.

A Test for Aircraft Gear Lubricants

By E. A. Ryder[1]

SYNOPSIS

There was published in the October, 1947, ASTM BULLETIN under the title "A Gear and Lubricant Tester," a description of the Pratt & Whitney Aircraft bench machine for the testing of gear materials and gear lubricants. Since that date, this machine has been put to use by several other laboratories and a large body of experience is now available. This machine offers a satisfactory method of assessing the antiscuffing properties of gear lubricants, and its use is being called for in oil specifications. This article describes the current procedure for this purpose.

THE ability of a lubricant to prevent gear scuffing is measured in the Pratt & Whitney Gear and Lubricant Tester which is a machine using as test specimens, a pair of gears like those used in an actual engine. While various other kinds of tests have been proposed by different experimenters, some of them relatively simple, using rollers instead of gears, none of these has shown as good correlation with results on actual engine gears as the Pratt & Whitney machine.

DESCRIPTION OF APPARATUS

The Pratt & Whitney Gear and Lubricant Tester was designed in 1941 and has undergone a long series of tests and further development since that time. This machine contains the following features:

1. It is usable at speeds up to 16,000 rpm.
2. Load is applied after the machine is in motion and any desired load can be applied up to the breaking strength of the gear teeth.
3. The gear-tooth load is indicated by simple hydraulic means.
4. The bearings of the machine are lubricated separately from the test gears so that two different lubricants can be used without mixing.
5. The teeth of the test gears may be examined by stopping the machine and looking into an inspection hole which is normally closed by a cork. After inspection, the machine may be restarted without having disturbed the gears or their mounting in any way.
6. The gears used as specimens are of aircraft quality, case hardened, and ground. They are similar in size and pitch to gears used in actual engines. Each pair of gears is used for two tests by reversing the gears on the shafts.
7. The absence of hunting teeth enables one to notice the bearing conditions of individual teeth and avoid confusion in interpreting results.

The phantom drawing, Fig. 1, shows the arrangement of the machine. In order to minimize power consumption, the familiar four square or Hopkinson coupling is used. Two parallel shafts are connected by two pairs of gears so that the power required to operate the rig is only the friction horsepower of the gears and bearings. The small spur gears are the replaceable test specimens while the large helical gears are permanent parts of the apparatus. A feature of this machine is the application of load to the test gears by axial movement of one helical gear relative to the other, accomplished by applying a known oil pressure to the piston-like hubs of the helical gears. From the helix angle and the area of the hubs, the tangential load may be calculated. (NOTE.—Due to rotation of the oil in the loading chambers, there is an error involved in this calculation. Calibration curves are available for different speeds up to the capacity of the machine. Tests which are made at a single speed are comparable without reference to the calibration curves.)

The Gear and Lubricant Tester and the test gears are commercially available. The driving motors, oil pumps, tanks, filters, etc., can be supplied by the user. A variable speed drive is desirable and the horsepower of the driving motor should be not less than 25. If tests are to be run at more than

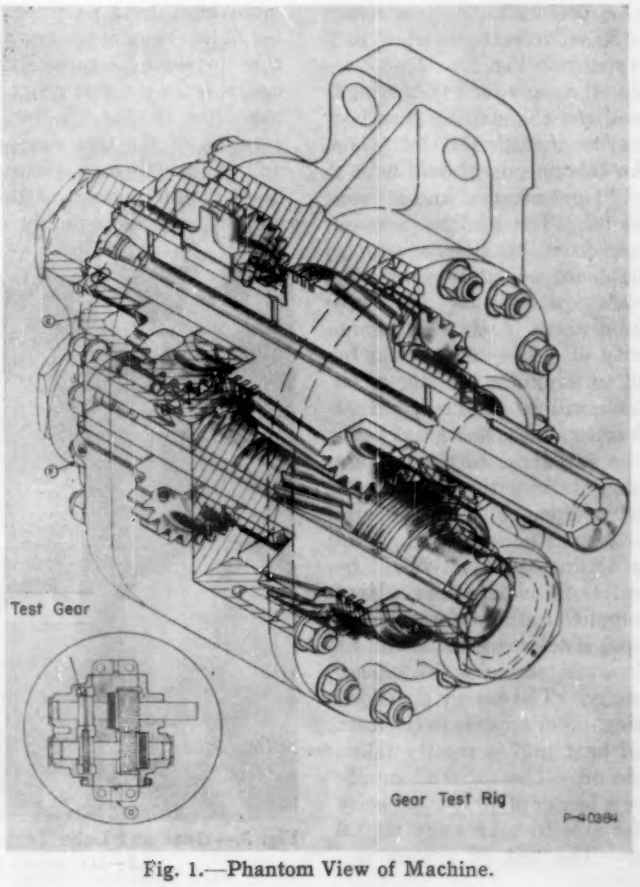


Fig. 1.—Phantom View of Machine.

[1] Consulting Engineer, Pratt & Whitney Aircraft Div., United Aircraft Corp., East Hartford, Conn.

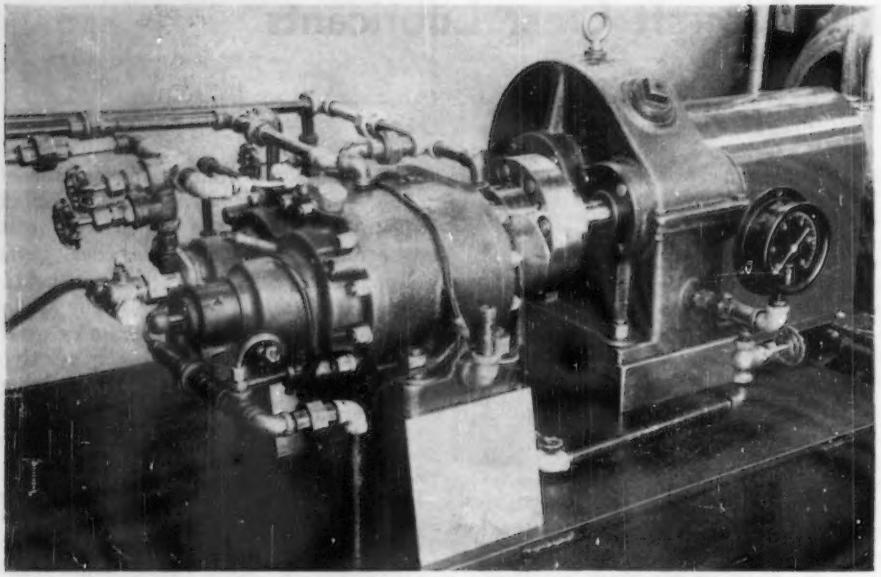


Fig. 2.—General View—Test Rig and Step-up Gear.

10,000 rpm, 40 to 50 hp is desirable. A number of different installations are available for inspection, and a laboratory which intends to install one of these lubricant testers for the first time will do well to consult someone who already has experience with it. While a good speed range is desirable for research and development work, if the rig is to be used only for routine checks or process control, a fixed gear ratio may be provided. Such a setup using an 1800-rpm motor and a 6:1 gear box is shown in Fig. 2.

The main oil supply for the bearings, helical gears, and the step-up gear box (if used) may be of grade 1100 oil. The oil pump for this purpose should have a capacity of 11 gal per min and a pressure of 150 psi. The loading pressure is also tapped from this main oil supply line through an adjustable pressure regulator. A separate oil system supplies jet lubrication to the test gears. The capacity of this sytem should be made small to minimize the size of oil sample which will be required. Shaft seals which separate the test gear chamber from the remainder of the rig prevent contamination of the test oil. A pump which will move 1 gal per min at 25 psi should be provided. Full flow filters or fine strainers should be provided on both oil systems. Heat should be supplied to the oil for warming purposes, and if tests are to be run at high speeds, considerable cooling capacity is necessary. The energy expended by the driving motor appears in the form of frictional heat and is mostly taken away by the oil. The main oil supply should have a heater of 4000-w capacity and a cooler able to take away 60,000 Btu per hr. The test oil system will operate with very much smaller heaters and coolers.

Removal and replacement of the test gears are easily done by taking off the anti-drive-end cover plate. This exposes the nuts and tab washers which hold the test gears in place on the two shafts. After running one test, the same gears may be reversed to run on the other sides of the teeth. Since the test gears are separated from the main gears by a partition in the housing, it is seldom necessary to disassemble the machine completely since any debris from the test gears is caught by the filter in the oil line. Visual inspection of the test gears with a light and binocular may be made through holes in the cover over the test gears, without any disassembly of the rig.

Test Procedure

The scuffing test is run in 10-min steps at successively increased loads. The minimum testing required for assessing the gear load capacity of a lubricant is two tests at 10,000 rpm. It is desirable to have more than two runs, and a suggested schedule is three runs at 10,000 and one at 2500 or 5000 rpm (this requires two pairs of test gears). For each kind of oil to be tested, new test gears should be used to avoid carry-over effects, and the test oil system must be carefully flushed. Each pair of gears is used for two tests by reversing the gears on the shaft so that the "A" and "B" sides of the gears are toward the shaft end, respectively. After one test and before reversing the gears, the test oil tank should be drained and refilled with new oil, but the system ordinarily need not be flushed out. If a second pair of gears is to be run on the same oil (making the third and fourth runs), refill for each run as above.

When changing from one kind of oil to another, drain the oil from the tank and as much of the system as possible. Put in a pair of used test gears. Fill the tank with Stoddard solvent (these directions apply to the test oil system, not to the main oil supply for the rig, which need not be changed) start both oil pumps and run the test rig at no load and low or moderate speed for 5 min. The heaters should be on during the running, but it is not necessary to wait for the temperature to come up to 165 F. Drain and fill the test system with the new test oil. Run the rig 5 min while heating the oil as before. Drain this first batch of test oil and recharge with more of the test oil and

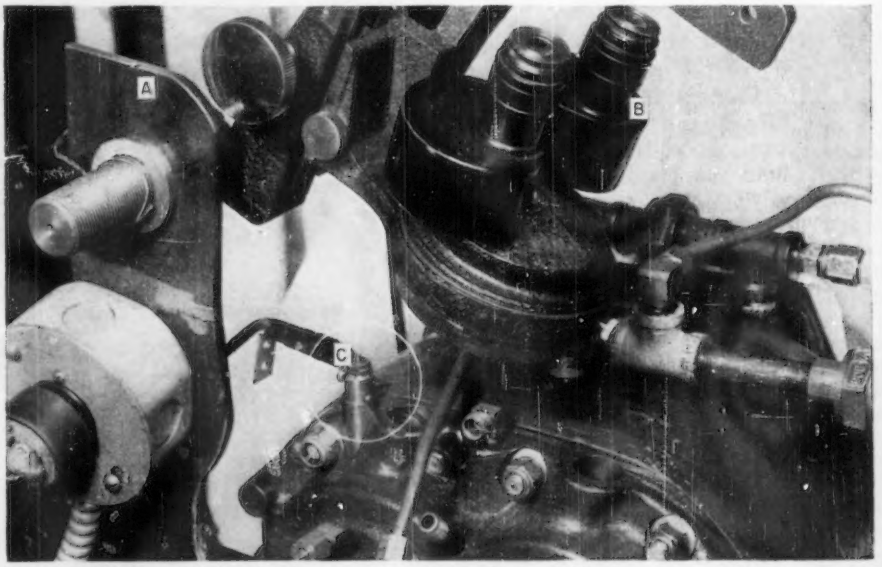


Fig. 3.—Gear and Lube Tester Showing Installation of Microscope and Viewing Light.
A—Microscope Mounting Bracket; *B*—Microscope; *C*—Light.

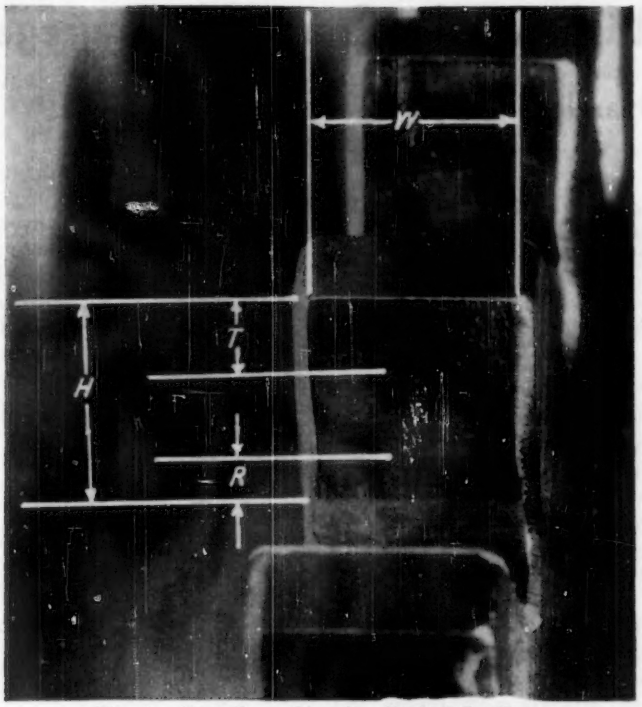


Fig. 4.—Test Gear, Showing Typical Scuffing.

put in a new pair of test gears. The test procedure may then be started as follows:

1. Heat test oil and main oil tanks to 165 F.
2. Start both oil pumps to circulate oil through the main and test oil systems until the piping and the test machine are thoroughly warm. In starting with cold apparatus this will take one half hour.
3. Start the gear tester and run 10 min at the test speed but with no load.
4. Stop the rig, remove plugs from inspection holes, and examine all the teeth of the test gears to make sure that no abnormal conditions are present.
5. Replace plugs, start oil circulation, and bring the machine to the specified speed, then apply a load of 5 psi to the loading chambers. Run 10 min at this condition. Oil temperature should be controlled to 165 F at the jet, and the flow of oil directed at the unmeshing point of the test gears should be 270 ml per min. (NOTE.—For quick warm-up it is advisable to flow oil through additional jets, but these must be shut off before the test begins.)
6. Stop the rig, uncover inspection holes, blow off surplus oil from the test gears, and put light and binocular microscope in place (Fig. 3). Examine the narrow-faced gear tooth by tooth and estimate the percentage or fraction of the tooth height that is scuffed. Scuffing begins at the tip and bottom of the tooth, and only the working height of the tooth is considered in estimating the amount of scuffing, (not the entire depth into the gullet). Estimate the amount of scuffing for each tooth as 5 per cent, 10 per cent, etc., and close up the rig preparatory to the next run. Figure 4 shows typical scuffing. The relative values of T, R, and H are judged by eye and the per cent scuffed is then $[100(T + R)]/H$.
7. Repeat as before at the same speed but with 10 psi loading pressure. Proceed with additional steps increasing the pressure by 5 psi each time, until scuffing appears on more than 25 per cent of the working face area of the teeth. Run two steps or 10 psi beyond the $22\frac{1}{2}$ per cent point (see following paragraph). Viscosity and neutralization numbers shall be taken before and after each test.
8. While interruption of the test may not seriously affect the results, it is desirable to have each test run through to completion once it has been started. In other words, it is undesirable to stop a test which is half done at quitting time one day and resume it the next day. The "down time" between runs should be standardized at 20 min. This allows time to inspect the teeth of the gears and get the rig running again and bring the oil temperature to the standard value.

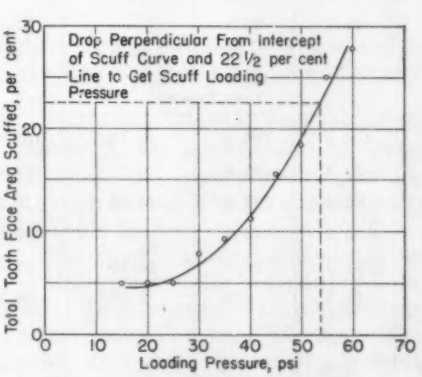


Fig. 5.—Typical Load-Scuff Plot.

EVALUATION OF RESULT

During the progress of the test, the amount of scuffing observed should be plotted (Fig. 5) as per cent of total tooth-face area scuffed against the loading pressure in psi. The value to be reported is that at which $22\frac{1}{2}$ per cent of tooth area is scuffed. This is equivalent to $\frac{2}{3}$ of the teeth scuffed for $\frac{1}{3}$ of the tooth area. Tests should be continued two steps or 10 psi beyond this point. For the purposes of this test, the definition of scuffing is that degree of scratching, scoring, wear, or abrasion which obliterates the axial grinding marks on the gear teeth. The face width of the gear is reduced by the chamfer used to break corners so that the average axial width of the narrow test-gear teeth shall be measured and reported (nearest 0.01 in.). See W on Fig. 4.

The nominal scuffing load of the oil in lb per in. width is calculated by multiplying the loading pressure for $22\frac{1}{2}$ per cent scuffing by 18.55 and dividing the product by the actual face width of the gear. For the purposes of this test, the error in gear load due to centrifugal force of the loading oil is neglected. Results thus calculated are comparable for one given speed. If more accurate absolute values are wanted, the appropriate correction factors can be employed.

Variation in Density of Lightweight Concrete Aggregates

By Harold S. Sweet[1]

SYNOPSIS

Tests of specific gravity, absorption, and concrete properties of different gradations of lightweight aggregates were performed. This paper describes the influence of the variation in specific gravity for different particle sizes on the problem of specifying sieve analysis limits on a weight basis, and on the design of concrete mixes for workability. It is concluded that certain modifications should be made in the grading specification for lightweight aggregates.

IN CONNECTION with an investigation of the concrete-making properties of lightweight aggregates locally available in Wyoming, different gradations were studied and specific gravity and absorption tests were made on the different size fractions of some of the aggregates. Significant changes were found in specific gravity and absorption with change in particle size. These data are reported and in general confirm the work of others. They probably are typical of the characteristics of many lightweight aggregates and are described here because they are considered to be pertinent to some of the questions regarding the grading limits in lightweight aggregate specifications. While it is indicated theoretically that a sounder basis might be had by expressing gradings and specification limits on a volume basis, it is probable that this is an impractical procedure for specifications; hence, if specification limits are to be expressed on a weight basis, it is considered that the effect of variations in density should be taken into account. Some comments are made with reference to methods of design of concrete mixtures with lightweight aggregates; the variations in density with size have a considerable effect.

One of the earliest reports on the specific gravity and absorption of different sizes of lightweight aggregates was that by Richart and Jensen in 1931 (1).[2] They showed that the bulk specific gravity of Haydite aggregate varied from 1.18 in the $\frac{3}{8}$ to No. 4 sieve size to 2.50 in the minus No. 200 size. They also discussed at length techniques for measuring specific gravity of such material and investigated a number of different procedures for determining when the saturated-surface-dry condition was reached. A number of investigators have noted that a larger proportion of fines is required in lightweight aggregate concrete, and some have explained that this is caused in part by the greater density of the fine material (2, 3). Sundt (4) reported that, "In pumice, on the other hand, finer material is considerably heavier than the coarser material. Minus 100 mesh pumice has a specific gravity of about 2.6 while the $\frac{3}{8}$ to $\frac{1}{2}$ in. size particles have a specific gravity of about 1.2 on the saturated-surface-dry basis and something less than 1.0 on the bone-dry bais." He further noted that "Because of these variations we have found it advantageous to express our sieve analyses in terms of absolute volume..... This correction is important in terms of fineness modulus. For example, a sieve analysis in terms of weights indicating a fineness modulus of about 3.25, when corrected to absolute volume would show a fineness modulus of about 3.75."

MATERIALS AND TESTS

Data on the specific gravity and its effect on gradings are presented for two varieties of pumice and one expanded clay aggregate. One pumice designated as Wyomingite pumice, is a fragmental, cellular material resembling a petrified sponge in appearance. It is composed of phlogopite mica, diopside, leucite, and a small amount of orthoclase. It varies in color from brown to yellow

[1] Associate Professor of Civil Engineering, University of Wyoming, Laramie, Wyo.

[2] The boldface numbers in parentheses refer to the list of references appended to this paper.

TABLE I.—ABSORPTION, SPECIFIC GRAVITY, AND GRADINGS OF WYOMINGITE PUMICE.

Sieve	24-hr Absorption, per cent	Bulk Specific Gravity	Cumulative per cent Passing									
			By Volume					By Weight				
			Grading A	Grading B	Grading E	Grading F	ASTM Specification C 33 - 49	Grading A	Grading B	Grading E	Grading F	ASTM Specification C 130 - 42
COARSE PUMICE												
1 in.	9.5	1.14	100.0	100.0	100.0	100.0	95–100	100.0	100.0	100.0	100.0	95–100
¾ in.	8.5	1.27	73.0	76.1	87.1	74.0	...	76.4	79.0	88.7	77.1	...
½ in.	8.0	1.34	44.3	47.9	46.3	46.0	25–60	48.4	51.4	48.9	49.6	25–60
⅜ in.	8.0	1.42	29.0	31.3	21.1	30.0	...	31.7	34.3	23.0	33.0	...
No. 4			0	0	0	0	0–10	0	0	0	0	0–10
FINE PUMICE												
No. 4	6.0	1.68	100.0	100.0	100.0	100.0	95–100	100.0	100.0	100.0	100.0	95–100
No. 8	5.5	1.90	65.7	70.7	79.3	95.0	...	72.0	77.0	84.2	96.3	...
No. 16	3.5	2.28	42.1	49.9	60.4	70.0	45–80	50.2	58.5	67.9	75.3	45–80
No. 30	2.0	2.48	29.5	35.6	45.5	45.0	...	36.3	43.2	52.5	50.0	...
No. 50	1.5	2.52	20.1	24.1	31.5	20.0	10–30	25.0	29.9	36.7	22.5	10–30
No. 100	1.4	2.57	14.5	17.2	21.3	8.0	2–10	18.1	21.7	25.0	9.1	5–15
Fineness modulus of fine pumice			3.27	3.02	2.62	2.62	...	2.98	2.70	2.34	2.47	...

TABLE II.—ABSORPTION, SPECIFIC GRAVITY, AND GRADINGS OF PUMICE N.

Sieve	24-hr Absorption, per cent	Bulk Specific Gravity	Cumulative per cent Passing									
			By Volume					By Weight				
			Grading G	Grading H	Grading J	Grading K	ASTM Specification C 33 – 49	Grading G	Grading H	Grading J	Grading K	ASTM Specification C 130 – 42
Coarse Pumice												
½ in.	23.0	0.77	100.0	100.0	100.0	100.0	90–100	100.0	100.0	100.0	100.0	90–100
⅜ in.	22.7	0.82	85.7	64.3	65.6	85.2	40–70	86.9	65.7	67.0	86.0	40–75
No. 4			3.4	0	0	0	0–15	6.6	0	0	0	0–15
No. 8	20.4	0.94	1.9	0	0	0	...	4.9	0	0	0	0–5
No. 100	2.1	2.20	1.8	0	0	0	...	4.7	0	0	0	...
Fine Pumice												
No. 4	20.4	0.94	94.1	100.0	100.0	100.0	95–100	95.6	100.0	100.0	100.0	95–100
No. 8	17.8	1.00	53.7	55.6	64.2	95.0	...	60.8	64.1	73.4	97.0	...
No. 16	15.8	1.52	16.7	26.6	39.1	70.0	45–80	26.9	39.1	53.6	80.9	45–80
No. 30	10.5	1.84	7.5	12.7	21.1	45.0	...	14.1	20.9	32.0	56.5	...
No. 50	5.0	2.04	5.2	4.9	8.9	20.0	10–30	10.3	8.6	14.3	27.0	10–30
No. 100	2.1	2.20	4.2	0	0	8.0	2–10	8.5	0	0	11.3	5–15
Fineness modulus of fine pumice			4.20	4.00	3.67	2.62	...	3.84	3.67	3.27	2.27	...

TABLE III.—ABSORPTION, SPECIFIC GRAVITY, AND GRADINGS OF EXPANDED CLAY.

Sieve	24-hr Absorption, per cent	Bulk Specific Gravity	Cumulative per cent Passing							
			By Volume				By Weight			
			Grading L	Grading N	Grading P	ASTM Specification C 33 – 49	Grading L	Grading N	Grading P	ASTM Specification C 130 – 42
Coarse Clay										
1 in.	24.6	0.83	...	...	...	...	...	...	...	...
¾ in.	26.4	0.83	...	100.0	...	90–100	...	100.0	...	90–100
½ in.	25.8	0.86	...	85.0	...	...	...	85.7	...	...
⅜ in.	27.9	0.90	100.0	41.5	...	20–55	100.0	42.8	...	20–55
No. 4			0	0	...	0–10	0	0	...	0–10
Fine Clay										
No. 4	27.7	0.99	100.0	100.0	100.0	95–100	100.0	100.0	100.0	95–100
No. 8	27.0	1.08	76.3	70.8	95.0	...	81.2	76.9	96.2	...
No. 16	27.0	1.06	54.7	53.0	70.0	45–80	62.5	61.5	75.2	45–80
No. 30			32.7	35.0	45.0	...	43.7	46.1	54.6	...
No. 50	21.7	1.31	20.8	20.4	20.0	10–30	31.2	30.8	29.2	10–30
No. 100	8.1	1.88	12.4	10.2	8.0	2–10	18.7	15.4	11.7	5–15
Fineness modulus of fine clay			3.03	3.11	2.62	...	2.63	2.69	2.33	...

and occurs in volcanic cones crowning a mesa of dense lava flows containing rocks of the same mineral character. When crushed the fragments are angular and of an extremely rough surface texture. Specific gravity and absorption data, determined by ASTM Standard Methods C 127[3] and C 128,[4] are given in Table I for the different size fractions (5). This table also contains comparisions of sieve analyses by weight and by absolute volume which are discussed below.

The other pumice, designated as pumice N, was a white, cellular, glassy material. Its specific gravity and absorption for the different sizes are given in Table II.

The specific gravity and absorption of the expanded clay are listed in Table III. This material was prepared experimentally in a small kiln in the Natural Resources Research Institute Laboratory on the University of Wyoming campus and was expanded by heating to 2300 F.

Significance of Variations in Density

Four of the gradings used in concrete made with Wyomingite pumice are shown in Table I. The greater density of the finer material causes the percentage passing, expressed in absolute volume, to be as much as 8 per cent lower than the percentage figure for the same gradation, expressed in terms of percentage passing by weight. This

[3] Standard Method of Test for Specific Gravity and Absorption of Coarse Aggregate (C 127 – 42), 1949 Book of ASTM Standards, Part 3, p. 782.
[4] Standard Methods of Test for Specific Gravity and Absorption of Fine Aggregate (C 128 – 42), 1949 Book of ASTM Standards, Part 3, p. 784.

difference occurs when only the fine aggregate grading is considered. When the grading of the combined aggregate is expressed in terms of weight and volume, much greater discrepancies occur; this point is considered indirectly in the discussion below on determination of the percentage of fine aggregate in the total aggregate.

Similar differences may be observed in Table II for pumice N, in the percentage figures expressed in terms of absolute volume, as compared to those in terms of weight, except that a maximum difference of 15 per cent occurs. Gradings by weight and by volume for the expanded clay are shown in Table III.

In each of these tables the present specification limits for the grading of lightweight aggregates, ASTM Specification C 130 – 42[5] are listed adjacent to the figures for the grading by weight; the specification limits for grading of nonlightweight aggregates, ASTM Specification C 33 – 49[6], are listed adjacent to the gradings by volume. In order to analyze some phases of the significance of these variations in density on grading limits, calculations of the effect of minor changes in the amount of fine material for grading F are shown in Table IV. Grading F was selected as a particle size distribution considered ideal for manufactured sand (6). Expressed in terms of volume, it falls well within the limits of ASTM Specification C 33, and expressed in terms of weight it falls well within the limits of ASTM Specification C 130. Grading F had a fineness modulus expressed by weight of 2.48 and expressed by volume of 2.62. In Table IV this gradation was modified so that the fineness modulus by volume was decreased 0.20, the limiting allowable change in fineness modulus as given in ASTM Specification C 33. In making this change in fineness modulus, the grading by volume was kept within the limits of the nonlightweight aggregate specification, C 33, by considering that the finest material was increased to the limit. Then the percentages by weight corresponding to this changed gradation were calculated. It may be observed in the table that the revised percentage by weight passing the No. 50 sieve falls outside the limit of ASTM Specification C 130, although it is within the specification limit for C 33 when expressed by volume. The fineness modulus by weight was reduced 0.22 or 8.9 per cent. A similar calculation was made assuming that the fine material had decreased in amount sufficient to cause an increase in the fineness modulus by volume of 0.20, still keeping within C 33 limits. When calculated to a weight basis the fineness modulus was changed the same amount, 8.9 per cent.

More striking discrepancies than these occurred when similar calculations were made for pumice N in grading K, as shown in Table IV. Grading K was the same ideal grading as grading F considered on a volume basis. In this case changing the amount of fines to the limit of C 33 to cause a change in fineness modulus of 0.20 caused the percentages by weight to be even further outside the limits of C 130. When the fines were decreased, the fineness modulus by weight changed 0.28 or 12.3 per cent. The results of similar calculations for the expanded clay are also shown in Table IV.

These calculations are considered significant since they indicate a few of the limits which would need to be set on the gradation and the allowable variation in fineness modulus if these materials were to be restricted to the same extent as the nonlightweight aggregates. It is considered that, assuming the restrictions on nonlightweight aggregates are approximately correct, variations of the indicated order of magnitude should be allowed for lightweight materials, especially since the fine material is heavier and shows a greater tendency to segregate, making representative sampling more difficult. These analyses might be summarized by the statement that a rather large variation in percentage of fine material by weight can occur without causing an objectionable variation in the amount by volume of these fines.

Concrete Workability

The workability of concretes made with Wyomingite pumice is summarized for different cement factors and the different gradings in Table V. It may be noted that because of the variations in density the percentages of fine aggregate by weight differ by as much as 14 per cent from the percentage by volume. The amount of fine aggregate actually used in the various concrete mixes is compared in this table to the amount which would be indicated as required according to the concrete mix design method developed by Goldbeck and Gray (7). It is of interest to note that the workability of concrete made with gradings B and F was good when the percentage of fine aggregate equaled or exceeded that calculated as required by this method.

Conclusions

1. A large increase in density occurred in the finer size of the lightweight aggregates described, and comparison with the literature indicates that this is probably typical of many lightweight aggregates.

2. Because of the tendency for the fines to settle out, representative sampling of lightweight aggregates is rather more difficult than for nonlightweight aggregates, and this is suggested as one reason that limits on grading of lightweight materials should not be more restrictive than those well estab-

[5] Standard Specifications for Lightweight Aggregates for Concrete (C 130 – 42), 1949 Book of ASTM Standards, Part 3, p. 720.

[6] Standard Specifications for Concrete Aggregates (C 33 – 49), 1949 Book of ASTM Standards, Part 3, p. 715.

TABLE IV.—SIGNIFICANCE OF SLIGHT VARIATION IN GRADATION OF FINE AGGREGATE.

Sieve	Gradings F, K, and P, per cent passing by Volume	ASTM Specification C 33 – 49, per cent passing	Change in Grades F, K, and P for 0.20 Change in Fineness Modulus by Volume								ASTM Specification C 130 – 42, per cent passing
			Per cent Passing by Volume		Calculated Per Cent Passing by Weight Resulting from Modification						
					Wyomingite Pumice		Pumice N		Expanded Clay		
			Increase F.M.	Decrease F.M.	Increase F.M.	Decrease F.M.	Increase F.M.	Decrease F.M.	Increase F.M.	Decrease F.M.	
No. 4	100	95–100	100	100	100.0	100.0	100.0	100.0	100.0	100.0	95–100
No. 8	95	...	95	95	96.3	96.3	96.9	97.1	95.9	96.4	...
No. 16	70	45–80	70	70	76.1	75.5	80.4	81.6	73.8	76.6	45–80
No. 30	45	...	41	53	45.6	58.5	51.3	65.5	48.6	63.4	...
No. 50	20	10–30	10	30	11.3	33.4	13.7	39.1	15.4	41.3	10–30
No. 100	8	2–10	2	10	2.2	11.3	2.9	13.7	3.1	13.8	5–15
Fineness modulus	2.62	...	2.82	2.42	2.69	2.25	2.55	2.03	2.63	2.08	...
Change from original fineness modulus by weight					0.22	0.22	0.28	0.24	0.30	0.25	...
Per cent change					8.9	8.9	12.3	10.6	12.9	10.7	...

TABLE V.—SUMMARY OF WORKABILITY OF AIR-ENTRAINED CONCRETE MADE WITH DIFFERENT GRADINGS OF WYOMINGITE PUMICE.

		Grading A	Grading B	Grading E	Grading F		
Fine aggregate in total aggregate, per cent	By weight....	43.2	53.9	41.7	52.1	48.1	43.5
	By volume...	32.2	41.7	29.6	38.2	34.5	30.2
	Cement Factor, sacks per cu yd						
Workability with different cement factors	4	...	...	...	Good	...	...
	5	...	Bad	...	...	...	...
	6	Poor	...	Poor	...	Good	...
	7	Poor	Fair	Poor	...	...	...
	8	...	Good	...	...	...	Good
Fine aggregate by volume[a] required for good workability, per cent	4	...	...	...	38.2	...	...
	5	...	43.1	...	...	...	...
	6	45.6	...	39.6	...	34.5	...
	7	43.7	40.9	38.2	...	...	...
	8	...	38.1	...	...	...	30.2

[a] Designed according to the method of Table I in "A Method of Proportioning Concrete for Strength, Workability, and Durability," by A. T. Goldbeck and J. E. Gray, *Bulletin No. 11*, Natl. Crushed Stone Assn., January, 1949.

lished for nonlightweight aggregates.

3. For the same restriction on grading by volume as set forth in ASTM Specification C 33 the allowable percentage passing the No. 50 sieve would need to be increased to 41 per cent by weight.

4. For the same restriction as imposed on nonlightweight aggregates, the fineness modulus of lightweight aggregates should be allowed to vary 0.30 or 12.9 per cent.

5. For 1-in. maximum aggregate, the method of concrete mix design for workability set forth by Goldbeck and Gray is indicated as being applicable to lightweight aggregate, although the amount of test data is limited to the extent that this observation must be considered tentative.

References

(1) Frank E. Richart and Vernon P. Jensen, "Tests of Plain and Reinforced Concrete Made with Haydite Aggregates," *Bulletin No. 237*, Engineering Experiment Station, University of Illinois, October 27, 1931, p. 17.

(2) Walter H. Price and William A. Cordon, "Tests of Lightweight Aggregate Concrete Designed for Monolithic Construction," *Journal*, Am. Concrete Inst., April, 1949, p. 590.

(3) D. D. Ritchie and S. H. Graf, "Expanded Shale Aggregate in Structural Concrete," *Bulletin No. 30*, Oregon State Engineering Experiment Station, August, 1951, p. 36.

(4) M. Eugene Sundt, "Discussion on 'Lightweight Aggregates for Concrete,'" *Miscellaneous Publication No. 23*, Natl. Ready Mixed Concrete Assn., February, 1949, p. 11.

(5) Calvin, Vaudrey, "Wyoming Pumice Concrete," Thesis, in partial fulfillment of requirements for the degree of Master of Science, University of Wyoming, July, 1950.

(6) A. T. Goldbeck, "Stone Sand for Use as Fine Aggregate," *Crushed Stone Journal*, June, 1951, p. 3.

(7) A. T. Goldbeck and J. E. Gray, "A Method of Proportioning Concrete for Strength, Workability, and Durability," *Bulletin No. 11*, Natl. Crushed Stone Assn., January, 1949.

Stress Relaxation in Plastics and Insulating Materials

By E. E. Wright[1]

Synopsis

Organic materials are in ever-increasing use for mechanical and electrical devices where satisfactory performance is required over long periods of time and under a wide assortment of atmospheric influences. Although the dimensional stability of plastics and electrical insulating materials under no-load conditions has been established reasonably well, there is an important gap in existing knowledge with regard to a material's ability to maintain adequate counter-stresses under compressive loading.

ASTM Method of Test D 621 – 51[2] uses a constant-load system and measures the material's resistance to gross deformation. However, this fails to simulate the usual application where the material is subjected to constant deflection (such as fastening devices, inserts, etc.) and is required to maintain adequate counter-stresses for the foreseeable life of the part. Therefore, it has been necessary to integrate data from Method D 621 with long practical experience in order to extrapolate between two dissimilar systems.

This paper describes a constant-deflection procedure for direct measurement of stress relaxation or change thereof, thereby permitting evaluation in terms of a material's ability to maintain a tight assembly under conditions simulating actual use. Apparatus for carrying out the test is described and typical data illustrating its usefulness are included.

In the engineering application of plastics and electrical insulating materials, loads of appreciable magnitude are impressed upon the parts. Although the character and extent of the loads vary greatly it has been observed that commercial organic materials may flow when subjected to such conditions. Furthermore, in hygroscopic substances the flow resulting from loading may have superimposed upon it such phenomena as swelling and shrinking. Whatever the combination of causes, the tendency to change dimensions can produce loosening of parts and consequent nonfunctioning of assembled apparatus. While this is not important in many articles of commerce, it becomes vital to the long-range service behavior of precision electrical and mechanical devices of which telephone central-office switching equipment is an excellent example.

An ASTM method for measuring so-called "cold flow" has been available for many years, namely, Tentative Methods of Test for Deformation of Plastics Under Load (D 621 – 48T). This method measures the diminution in height of a cube when held under a constant load. However, only seldom is a plastic material held under a constant load in its engineering application. The load usually confining a plastic part is diminishing as flow or shrinkage of the part progresses. The manner in which the load changes depends upon the flow and shrinkage of the plastic and various other characteristics of the two systems. Needless to say, it is a difficult thing to predict from no-load or constant-load data. Therefore, it becomes highly desirable to measure stress relaxation directly.

Apparatus and Procedure

The test equipment consists of a load-measuring device designed to have the same load-deflection characteristics as the metallic system confining the plastic part. Naturally, this device will vary in size and shape as the load-deflection characteristics vary. A typical device is illustrated in Fig. 1 which shows an

[1] Bell Telephone Laboratories, Inc., Murray Hill, N. J.

[2] Standard Methods of Test for Deformation of Plastics Under Load (D 621 – 51) 1949 Book of ASTM Standards, Part 6, p. 631.

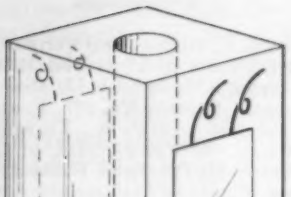


Fig. 1.—Aluminum Column with Two SR-4 Strain Gages Attached.

aluminum column (24ST Dural) 1 in. high, 0.7 in. on edge and with a $^{23}/_{64}$ in. hole through the center. It was designed to deflect 0.0002 in. under a load of 1000 lb to duplicate those engineering applications where the confining metallic system is strained only slightly, that is, a substantially constant-deflection system. Two SR-4 strain gages ("B" type) were cemented to the aluminum column and coated with wax. In Fig. 1, the lower plate is a steel cap used to transmit the load from the column to the specimen. The device is calibrated by applying various loads and recording the microinch reading on the strain indicator for each load. A temperature compensator was prepared by attaching two SR-4 strain gages to another aluminum column of approximately the same size but not in the loaded assembly.

In Fig. 2 the assembly of the test equipment is shown. It consists of a machinist die-set to which two heavy steel bolts have been added. There are two loading systems built into this device. One loading system consists of the aluminum column previously described. As the upper platen of the die-set is forced down by means of the two nuts, a load is applied to the specimen through the aluminum column. The other loading system, primarily for checking zero-load readings, consists of a steel bar passing through the hole in the aluminum column and resting on the projection of the steel cap. The other end projects vertically through the upper plate and contains a thrust bearing. A load is applied to the specimen by means of the steel bar by turning down the larger bolt on the top of the equipment. Two SR-4 strain gages are used and calibrated—load against microinch reading of the strain indicator. Figure 3 shows the two loading systems.

The most serious limitation to the use of strain gages is the drift in the zero

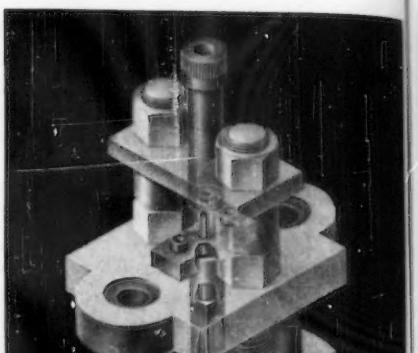


Fig. 2.—Assembled Test Equipment.

load - microinch reading. This is due partially to the gain or loss of moisture and consequent dimensional changes in the strain gage. Also, when the device is held under load for long periods, there may be some flow in the cement. In any event, the zero load - microinch reading varies, and it is essential in these tests that the zero-load reading be checked at frequent intervals. Therefore the two loading systems were provided so that at any time during the test the load may be temporarily transferred to the steel bar.

The load is transferred from the aluminum column to the steel bar as follows. Let us assume that a test has been under way for several days. Originally, 1000 lb had been applied to the test specimen, and due to flow of the plastic, the counter-stress has decreased to 800 lb at which time it is desired to check the zero load - microinch reading of the SR-4 strain gages. First, apply approximately 200 lb to the specimen

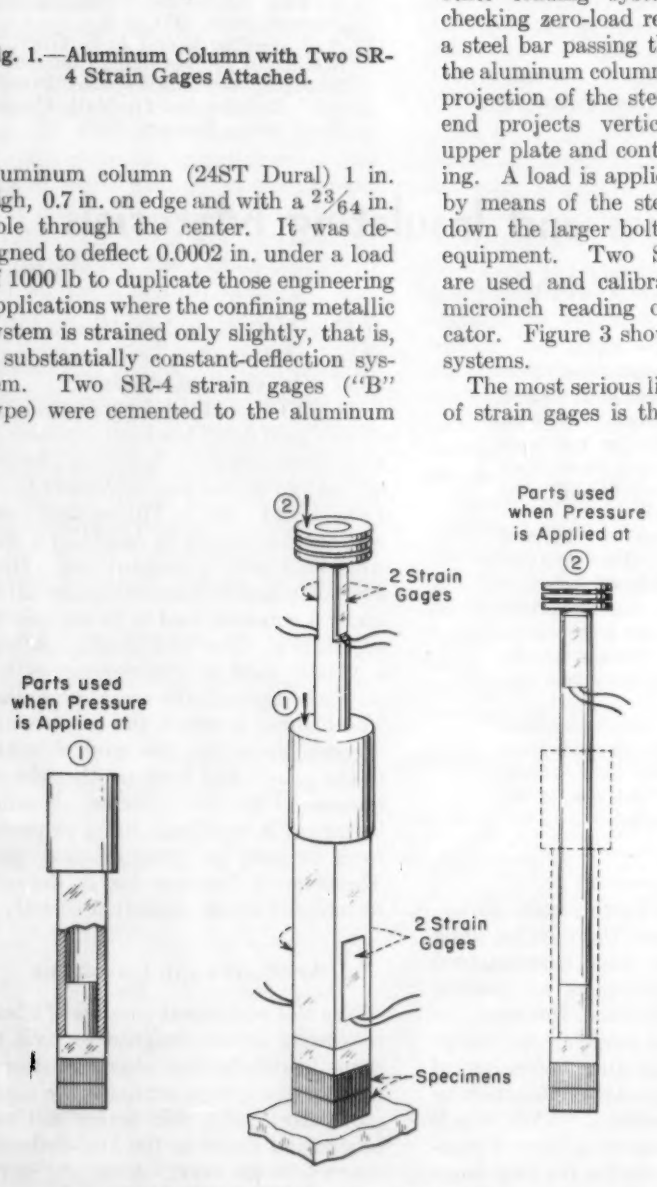


Fig. 3.—Details of Loading System.

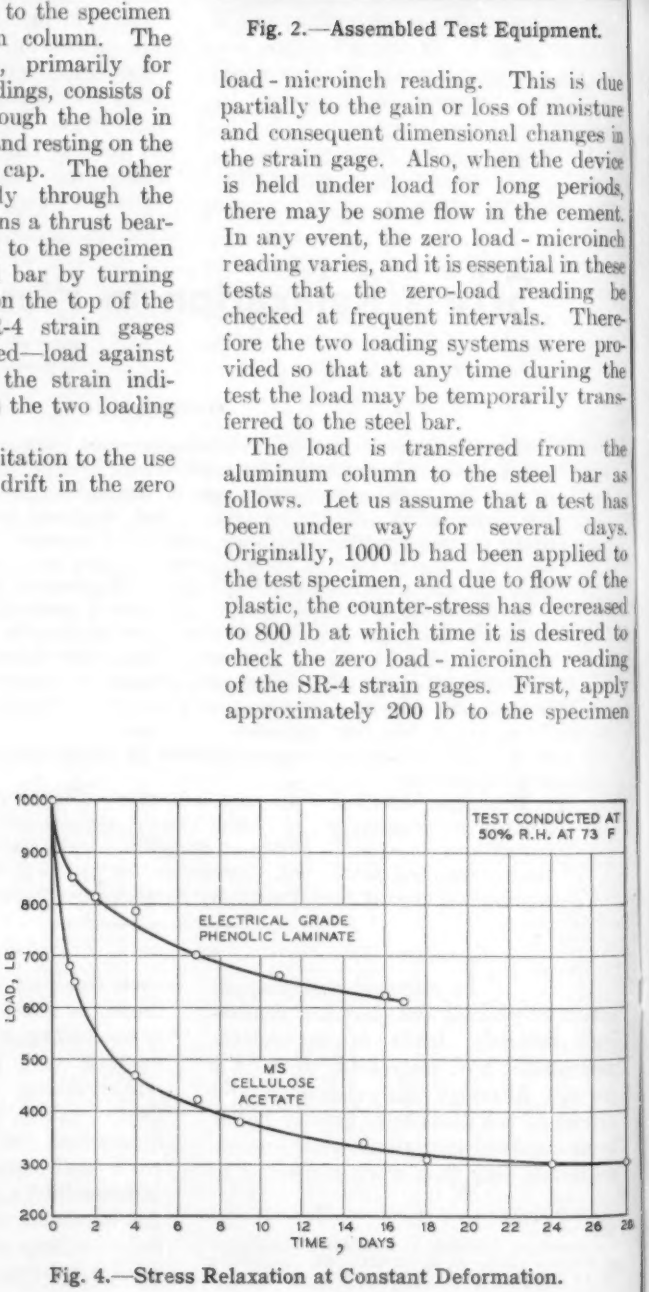


Fig. 4.—Stress Relaxation at Constant Deformation.

through the steel bar by turning down the upper bolt. Measure both loading systems. Now remove approximately 200 lb from the aluminum column by loosening the two bolts holding the steel plate to the top platen, Fig. 2. Again measure both loading systems. Continue in the same manner by adding, in small increments, loads to the steel bar and removing approximately a corresponding amount from the aluminum column until the load has been completely transferred to the steel bar. Now ascertain the zero-load reading of the gages on the aluminum column. The load is transferred back to the aluminum column by reversing the process, that is, the load is simultaneously built up on the aluminum column and lowered on the steel bar in small increments.

Results

The stress relaxation of cellulose acetate butyrate, grade MS, was determined. The specimen consisted of two pieces of the plastic, 0.500 by 0.500 by 0.250 in. (±0.002 in.). The material was conditioned for twelve days at standard laboratory conditions—50 per cent relative humidity at 73 F—and then placed under a load of 1000 lb using the aluminum column shown in Fig. 1. The test was allowed to proceed under the same standard laboratory conditions, and, at frequent intervals, the load was determined in order to follow the progress of the stress relaxation. Also, at appropriate periods the load was transferred from the aluminum column to the steel bar in order to determine the zero load - microinch reading of the SR-4 strain gages. The results are shown in Fig. 4.

A similar test was run on a pile-up of $\frac{1}{64}$ in. thick electrical grade laminated phenolic. A number of $\frac{1}{2}$-in. squares were conditioned several months at 50 per cent relative humidity and 73 F. A pile-up $\frac{1}{4}$-in. high was placed in the test equipment and a load of 1000 lb applied by means of the aluminum column shown in Fig. 1. The progress of the stress relaxation was followed by observing the load on the column from time to time. Any variations in zero load - microinch reading of the gages were corrected. The results are shown in Fig. 4.

The above procedures measure the stress relaxation of a material at nearly constant deflection. The aluminum column can deflect 0.0002 in. with a load of 1000 lb. The steel die-set (see Fig. 2) can deflect approximately 0.0002 in. with the same load which gives a total deflection of 0.0004 in. It is by this amount that the actual height of the specimen can diminish during the test.

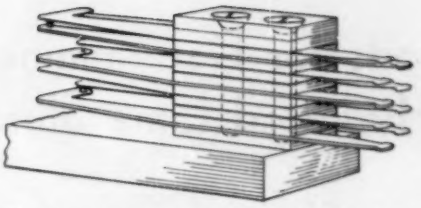


Fig. 5.—Pile-Up of Relay Contact Springs.

Simulated Service Procedures and Results

In engineering applications where the material is held under a load by metal parts, there are many cases where the metal system itself is appreciably strained by the load involved. An excellent example is the laminated phenolic insulators used in contact-spring pile-ups for relays and switches. Such an assembly is shown in Fig. 5. Two steel screws pass through the assembly and, when tightened, compress the pile-up between the top and bottom steel plates. As loads of considerable unit stress are applied to the insulators, they tend to flow. Also, as the assembly is exposed to alternate high and low humidity many times during its life, moisture is absorbed by the fiber and subsequently lost. The combinations of flow and shrinkage may be sufficient in some cases to cause loosening of the pile-up.

In the manufacture of these pile-ups the assembled springs and insulators are placed in a fixture where a load of 1700 lb is applied by means of an external press. The two screws are tightened to 16 or 20 in.-lb, after which the external load is removed. It has been calculated that tightening the screws to this amount applies to load of 500 to 600 lb. On removal of the external load the fiber and the metal restraining system come to equilibrium at approximately 1500 lb.

The stress relaxation characteristics of the fiber insulators were determined as follows: The load deflection characteristics of the two steel screws were first determined. An aluminum column was then designed with the same load-deflection characteristics as the two steel screws, namely, a deflection of 0.004 in. at 1500 lb. Two SR-4 strain gages were attached and the column was subsequently calibrated. Some electrical-grade laminated phenolic insulators $\frac{3}{64}$ in. thick were conditioned for 13 days at 43 per cent relative humidity at 77 F. An actual pile-up of nickel-silver springs and insulators was assembled in the test equipment (Fig. 2). A load of 1700 lb was applied through the steel bar loading system. While holding this load constant, a further load of 500 lb was applied through the aluminum column. The load of 1700 lb was then removed and the aluminum column and fiber pile-up came to equilibrium at 1540 lb. The test was allowed to proceed at 50 per cent relative humidity at 73 F for about 120 days. It was then transferred to 90 per cent relative humidity at 85 F for one month after which it was dried over anhydrous calcium chloride at 73 F. During this time, the load on the aluminum column was observed at frequent intervals. Also, any changes in the zero-load reading were observed and corrections made. The results are shown in Fig. 6.

Conclusion

The procedure described in this paper provides a means of measuring the stress relaxation of plastic materials under conditions simulating actual use. The data on several materials are given simply to illustrate the usefulness of the test.

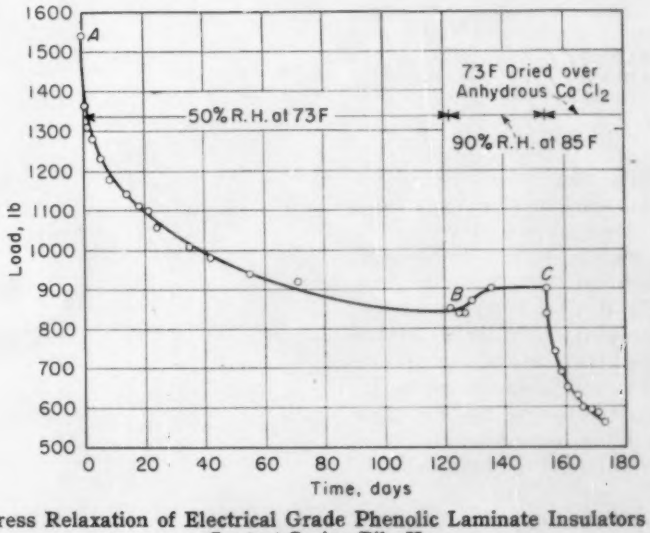


Fig. 6.—Stress Relaxation of Electrical Grade Phenolic Laminate Insulators in a Relay Contact Spring Pile-Up.

A Study of Methods for Determining the Settling Rate of Hydrated Lime Slurries

By R. K. Thomas[1]

THE settling rates of milks of lime made from quicklime and hydrated lime are an important consideration from the standpoint of the users of such materials, and a number of different methods of making such a test are in use throughout the industry. Recognizing the need for some standardized test procedure to measure this characteristic of lime slurries, Committee C-7 on Lime, through its Subcommittee V on Methods of Test, has been engaged throughout the past several years in studying several proposed methods.

Former work done on this problem, using a method proposed by the committee, did not appear to give results which were satisfactory from the standpoint of concordance among different laboratories, and at the meeting held in June, 1951, it was proposed that further work be done. At that time various changes in the method then under consideration were proposed and commented upon. These changes were then consolidated and made a basis of another proposed standard test, and it was decided to perform a series of round-robin tests comparing the old method and the new proposed method, the idea being to evaluate these two.

The following laboratories agreed to work on this problem and make check tests on samples sent to them:

G. & W. H. Corson (L. J. Minnick)
Kelley Island Lime & Transport Co. (A. E. Pavlish)
Arthur D. Little, Inc. (R. W. McAllister)
Marblehead Lime Co. (Wallace Wing)
Massachusetts Institute of Technology (H. C. Fischer)
National Gypsum Co. (D. G. Hamme)
Riverton Lime & Stone Co. (P. L. Rogers)
Warner Co. (R. K. Thomas)

The methods used in this evaluation are detailed in the following paragraphs; their differences are found essentially in the manner in which the original slurry is made up. The first, or "Proposed ASTM Method," requires slurrying in a large volume of water in the tube actually used for comparison; whereas, the second, or "Modified Method," requires that the sample be first made into a thick putty, using a small amount of water, and allowed to stand in putty form before being diluted to the proper volume for the test. This second method was proposed for the reason that it was felt to give a more intimate mix of the lime with the water than would be possible using a mere shaking procedure.

Proposed ASTM Method:

Place 10 g of lime hydrate in a 100-ml graduate (internal diameter about 2.4 cm), wet with about 50 ml of distilled water at 70 F and shake vigorously to complete suspension. Allow the graduate and contents to stand at 70 F for 2 hr, and then make up to the 100-ml mark with distilled water at 70 F. Shake the graduate and contents vigorously and then allow to stand for 24 hr undisturbed. Report the sedimentation height in milliliters after ¼, 1, 2, 4, and 24 hr (final volume) standing.

Modified Method:

Weigh out accurately 10 g of the dry, hydrated lime into a dry 150-ml beaker and slurry with sufficient distilled water (70 F) to make a thin putty (15 to 20 ml). The mixture of lime and water should be stirred thoroughly with a rubber tip glass stirring rod during the mixing process. Allow this putty to stand covered for ½ hr at a temperature of 70 F. Wash the contents of the beaker into a dry, glass-stopper 100-ml graduated cylinder and scrub the beaker thoroughly to remove all lime adhering to the sides. Dilute to the 100 ml mark, shake vigorously for about 1 to 2 min, and allow to stand undisturbed at a temperature of 70 F. Record the level of the sediment at 15-min intervals for 1 hr and then at the 2, 4, and 24-hr periods.

The program was limited to a consideration of settling rates of hydrated

TABLE I.—RESULTS OF TESTS ON SAMPLE NO. 1.

Supernatant Liquid, ml						
15 min	30 min	45 min	1 hr	2 hr	4 hr	24 hr
Proposed ASTM Method						
25.0	49.4	60.3	62.5	67.5	71.9	75.0
..	46.0	..	54.0	59.5	64.5	70.5
..	57.0	..	61.5	66.5	70.5	74.5
26.0	52.5	56.5	59.5	64.5	68.0	72.0
..	40.0	..	57.0	62.0	67.0	72.0
24.0	49.0	54.5	57.0	61.0	66.0	71.0
..	57.0	..	61.0	65.0	70.0	72.0
Average 25.0	50.1	57.1	58.9	63.7	68.3	72.4
Modified Method						
30.5	58.1	63.1	65.2	69.8	73.7	75.8
19.5	43.0	59.0	61.0	67.0	72.0	75.0
44.5	64.0	67.5	69.5	73.0	76.0	77.0
31.5	57.5	61.5	63.0	70.0	74.0	76.5
37.0	63.0	66.0	68.[illegible]	72.0	75.0	76.5
24.0	50.0	57.0	61.[illegible]	66.0	70.0	75.5
33.0	56.5	61.0	63.0	67.5	71.5	75.0
..	61.0	..	66.0	70.0	75.0	76.0
Average 31.4	56.6	62.2	64.7	69.4	73.4	75.9

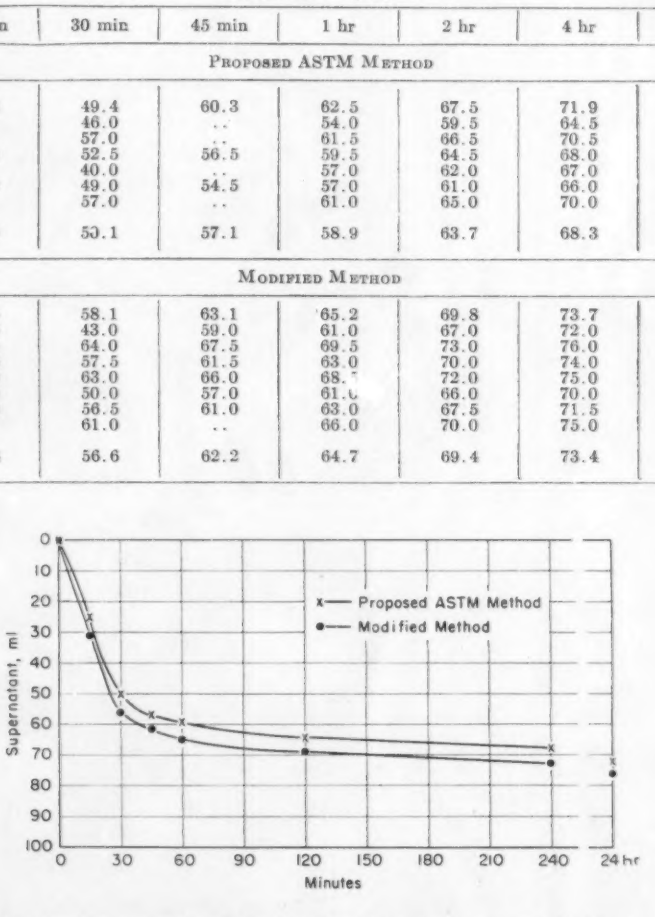


Fig. 1.—Average Results of Settling Rate Tests on Sample No. 1.

[1] Chief Chemist, Warner Co., Bellefonte Div., Bellefonte, Pa.

limes and samples were selected so as to give a range of settling characteristics. Such samples were provided by the Kelley Island Lime and Transport Co. and consisted of samples Nos. 1 and 2 of dolomitic hydrated limes, both of which were fast-settling hydrates. Sample No. 3 was a high calcium hydrate having a slow rate of settling.

As would be expected in a program encompassing the number of laboratories which performed cooperative work on these samples, the amount of data obtained was voluminous and for best understanding must of necessity be broken down in some sort of fashion, which the writer has chosen to be by sample tested. The results obtained on sample No. 1 are shown in Table I and Fig. 1.

Study of this table shows the results of the Proposed ASTM Method to be quite variable, particularly up to 45 min. Results among the different laboratories after 1 hr all show fairly good checks. The extreme results are reported by two separate laboratories, with results of all other laboratories falling within a comparatively narrow range.

Results obtained by the Modified Method likewise show considerable variation. The high results are all due to one laboratory, but low results to several different laboratories. Three laboratories showed good checks at all time intervals. Here again the results obtained after 1 hr of settling are in line.

The results obtained on sample No. 2 are shown in Table II and Fig. 2.

Reported results for the Proposed ASTM Method show variation at early times, with the results again falling in line after the samples have set for 1 hr. Three laboratories showed good check results at all time intervals and two other laboratories likewise showed good checks at all time intervals, but the two sets of results are not too close together.

The Modified Method indicates good checks on all but two laboratories, and here again the divergence which can be noted at the earlier time intervals narrows down after the sample has been allowed to stand for 1 hr. Two laboratories show good checks at one degree of settling and two other laboratories show good checks at another degree of settling.

The results obtained on sample No. 3 are shown in Table III and Fig. 3.

The reported results of the Proposed ASTM Method are considered to be good checks, with the exception of one laboratory, where results through 1 hr are high.

The Modified Method results of the seven laboratories reporting by this method show four good checks at one level and three good checks at another level, the two sets being rather out of line with each other.

The average values obtained on the three samples, as listed in Table IV, indicate that the samples show the same rate of settling, regardless of method. The marked difference to be noted is that the results by the Modified Method show a slightly faster rate of settling. The similarity of the rates is best shown by the charts. The nature and slope of the settling curve are the same, sample for sample, by either method of test. An interesting fact also best shown by the curves is the better check of average results on a slower settling lime.

Discussion

Close study and comparison of the individual values as reported at the separate time intervals show a comparatively wide diversity of results in the cooperating laboratories regardless of the method used. Neither method shows any marked superiority from the standpoint of reproducibility of results in a large number of laboratories working on the same sample.

On the basis of the extreme range experienced at individual time intervals, the Proposed ASTM Method appears to give closer coordination. The greatest differences in results, or widest range, are in the rates at 15 and 45 min. Here the findings can undoubtedly be partly discounted as to variation, since more laboratories reported results at these time intervals using the Modified Method than was the case using the Proposed ASTM Method. With the Proposed ASTM Method results were reported by only three laboratories on samples Nos. 1 and 2 and by only two laboratories on sample No. 3; whereas, the results by the Modified Method were reported by seven laboratories for samples Nos. 1 and 2 and six laboratories for sample No. 3. Thus the chance of extreme variations was considerably lessened.

Results by the Modified Method appear to be more consistent throughout all time intervals. The results of any one laboratory on any one sample fall in the same order over the whole time lapse in more instances with this method.

TABLE II.—RESULTS OF TESTS ON SAMPLE NO. 2.

Supernatant Liquid, ml						
15 min	30 min	45 min	1 hr	2 hr	4 hr	24 hr
Proposed ASTM Method						
25.8	48.6	66.7	72.5	74.2	74.4	74.7
..	38.5	..	65.5	73.5	75.0	75.0
..	54.5	..	67.0	74.5	75.0	75.0
25.5	48.0	64.0	72.0	73.5	74.0	74.0
..	41.0	..	68.0	74.0	77.0	77.0
25.5	45.0	59.5	68.0	75.0	76.5	77.0
..	47.0	..	72.0	75.0	75.0	75.0
Average 25.5	46.0	63.4	69.2	74.2	75.2	75.3
Modified Method						
28.4	52.6	68.2	72.4	74.7	74.9	75.1
30.0	53.0	65.0	73.0	75.0	75.5	76.0
32.0	55.0	69.0	73.0	75.0	75.0	75.0
25.5	48.0	58.5	66.0	75.0	77.0	77.0
33.0	58.0	71.5	73.0	74.0	74.0	74.5
26.0	53.0	63.0	71.0	75.0	76.0	76.0
29.0	50.5	69.0	73.0	76.0	76.5	77.0
..	48.0	..	73.0	75.0	75.0	75.0
Average 29.1	52.2	66.3	71.8	74.9	75.4	75.7

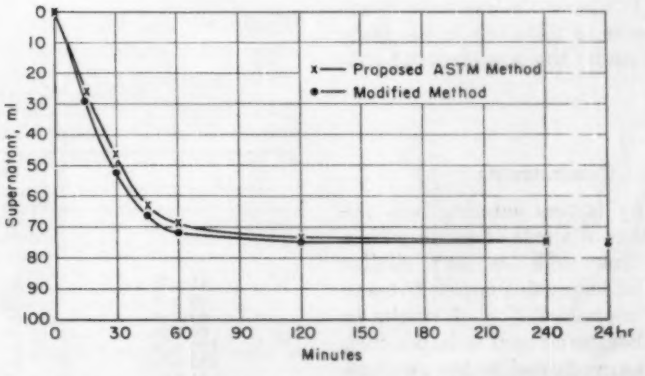


Fig. 2.—Average Results of Settling Rate Tests on Sample No. 2.

That is, a laboratory reporting results which might be considered either high or low at a given time interval usually reported results in the same order at all time intervals. Conversely, results by the Proposed ASTM Method were more jumbled. Further, where laboratories reported more than one result by the methods being studied, the range of difference in the results using the Modified Method was less than that shown for the Proposed ASTM Method. Thus it shows a possibility of closer check of samples in the same laboratory.

Both methods showed good checks in rates at and after the 1-hr period of settling, and final volumes were generally in accord, both as regards the same method and the two methods. The differences in results between the two methods were less for a slow settling lime than for a fast settling lime, taking into consideration all time intervals.

As a side check, along with the primary purpose of evaluating the two methods, some study was made of the influence of size of graduates on the results obtained. Results were reported in terms of millimeters of height as well as milliliters of volume. All tubes used for the test were standard 100-ml graduates and there was noted no marked difference in results reported on the basis of height or distance of fall. The figures in per cent of height measured differ from the figures for per cent of volume to the extent of tenths of a per cent at most, and in a great many instances were identical. This fact may not be true when comparing results obtained in the same laboratory, but the differences obtained in a number of laboratories on any one sample are so great that the comparative height of the tube used appears to be of little consequence. This statement would, of course, be true only where such differences in size are slight and would not preclude the use of equipment having extremely wide variations in size.

Small variations in the temperature at which the test is run do not appear to have undue influence on results when compared on the basis of different laboratories. Temperature does have an effect on results of tests run in the same laboratory under the same general conditions.

TABLE III.—RESULTS OF TESTS ON SAMPLE NO. 3.

	Supernatant Liquid, ml					
15 min	30 min	45 min	1 hr	2 hr	4 hr	24 hr
Proposed ASTM Method						
..	18.0	..	29.0	57.0	66.0	67.5
..	18.5	..	32.0	55.5	67.5	68.0
7.5	16.0	23.0	30.5	57.0	64.5	66.5
..	14.0	..	33.0	54.5	63.0	68.0
8.0	15.0	23.5	29.5	55.0	63.0	68.0
..	20.0	..	40.0	55.0	65.0	66.9
Average 7.8	16.9	23.3	32.3	55.7	64.8	67.3
Modified Method						
6.0	14.5	21.5	29.5	56.0	64.0	67.5
10.5	20.5	29.0	38.5	62.0	66.0	66.5
8.5	16.5	23.5	33.0	46.0	63.5	67.5
10.0	19.5	28.0	37.0	58.0	64.5	65.5
7.0	15.0	21.0	28.0	54.0	63.0	67.0
9.5	17.5	26.5	32.5	57.0	64.5	68.5
..	22.0	..	41.0	56.0	66.0	66.0
Average 8.6	17.9	24.9	34.2	55.6	64.5	66.9

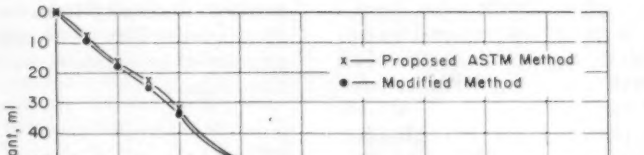


Fig. 3.—Average Results of Settling Rate Tests on Sample No. 3.

Conclusions

The many factors entering into the determination of a rate of settling for a hydrated lime milk or any similar finely divided suspension appear to make very close reproducibility of results in different laboratories next to impossible. The results are affected to too great an extent by small differences in technique of the person making the test. The results obtained by these tests are typical of such determinations and the checks obtained in the cooperating laboratories working on this program are on the whole considered to be good. In many instances the closeness of check shown by several laboratories is surprisingly good.

Either method studied is clearly able to distinguish between a fast and slow setting hydrate, but only that. Checks of rates to close limits of, say 1 to 2 ml, are not possible.

The Modified Method, despite its requirement of more manipulation on the part of the tester, is slightly better and should, after practice to establish good technique, give results which could be checked within reasonable limits in another laboratory.

TABLE IV.—AVERAGE VALUES OF THREE SAMPLES.

	Supernatant Liquid, ml					
	Sample No. 1		Sample No. 2		Sample No. 3	
	Proposed ASTM Method	Modified Method	Proposed ASTM Method	Modified Method	Proposed ASTM Method	Modified Method
15 min	25	31	26	29	8	9
30 min	50	57	46	52	17	18
45 min	57	62	63	66	23	25
60 min	59	65	69	72	32	34
120 min	64	69	74	75	56	56
240 min	68	73	75	75	65	65
24 hr	72	76	75	76	67	67

Fatigue Machines for Low Temperatures and for Miniature Specimens

By W. N. Findley,[1] P. G. Jones[1], W. I. Mitchell,[2] and R. L. Sutherland[3]

SYNOPSIS

The design and features of the following new types of fatigue testing apparatus are described: (*a*) A high-speed rotating-beam fatigue machine designed for operation at temperatures as low as −320 F. This machine employs a vertical spindle and has a device for adjusting the alignment of the specimen. (*b*) A repeated-bending fatigue machine for tests at temperatures as low as −320 F. This machine was equipped with a device to permit tests in bending, torsion, or combined bending and torsion. Various mean stresses may also be employed. (*c*) A repeated-bending fatigue machine equipped with suitable fixtures to permit tests of miniature specimens $\frac{3}{4}$ in. long in either bending or torsion.

THE three fatigue testing machines described in this paper were constructed to make possible fatigue testing under conditions for which existing apparatus was inadequate. It was desired to explore at still lower temperatures the marked increase in fatigue strength with decreasing temperature observed in previous tests of plastics (**1, 2**).[4] Attempts were made to modify existing machines to permit fatigue tests in liquid air. The problems encountered, however, made it necessary to consider designing new equipment especially for this purpose. Machines of two different types were accordingly constructed as described in the first two sections of this paper.

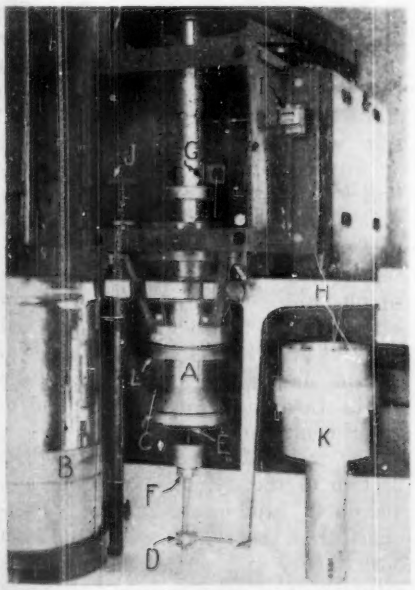


Fig. 1.—Rotating-Beam Fatigue Machine for Low-Temperature Tests.

Also the analysis of fatigue data collected for specimens tested under combined bending and torsion indicated a need for information on the isotropy of the rolled bars from which the specimens were made. Since these bars were only $\frac{7}{8}$ in. in diameter, the length of the specimens had to be less than $\frac{7}{8}$ in. Thus special apparatus and techniques had to be devised as described in the last section of this paper.

ROTATING-BEAM FATIGUE MACHINE FOR LOW-TEMPERATURE TESTS

This machine was constructed to permit fatigue tests at relatively high speeds (6400 rpm) and low temperatures. High-speed testing was desirable in order to reduce the testing time and consequently the cost of refrigerant.

A rotating-beam fatigue machine was selected as the most suitable means of securing high testing speeds. Figure 1 shows the completed machine. A vertical spindle, *A*, was employed so that the specimen could be immersed in a cooling liquid (such as liquid nitrogen) contained in a vacuum flask, *B*. The several features of the spindle are illustrated in Fig. 2.

A special chuck built into the spindle permitted fine adjustments of the specimen so that it would run true. This chuck consisted of a block, *C*, having a hemispherical surface. This block was clamped on the matching lower end of the spindle by four screws. The center of the hemispherical surface was at the center of the specimen and the four screws were each placed perpendicular to a radius of the spherical surface. Thus these screws served both to hold block *C* in place and to provide adjustment. Differential tightening of opposing screws served to rotate block *C* in its seat and made a very effective means for compensating for the slight misalignment of parts which is always present or for the slight warp often encountered in plastic specimens. In practice a dial gage was placed against the lower bearing housing, *D*, during adjustment to indicate run-out of the bearing. The lower portion of the spindle was a thin-walled tube to reduce the transfer of heat to a minimum. Fins for heat transfer were provided as an integral part of the spindle and located between the bearing and the specimen, as shown in Fig. 2 in order

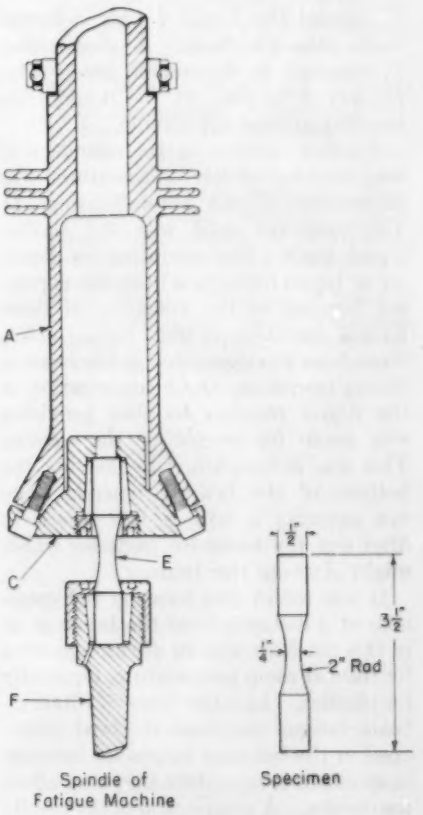


Fig. 2.—Specimen and Detail of Vertical Spindle Fatigue Machine.

[1] Research Associate Professor and Associate Professor, respectively, Department of Theoretical and Applied Mechanics, University of Illinois, Urbana, Ill.

[2] Assistant Professor of Civil Engineering, South Dakota School of Mines, Rapid City, S. D., formerly Instructor, University of Illinois.

[3] Assistant Professor of Mechanical Engineering, University of Iowa, Iowa City, Iowa, formerly Special Research Associate, University of Illinois.

[4] The boldface numbers in parentheses refer to the list of references appended to this paper.

to keep the bearing from becoming too cold.

The specimen, *E*, is illustrated in Fig. 2. It had cylindrical ends for ease in machining and was clamped in the block *C* and in the extension, *F*, by tapered split-collets as shown. The spindle was locked during tightening of the collets and screws by a pin extending through a hole, *G*, in the shaft (see Fig. 1) and into the frame. Withdrawal of the specimen from the upper collet was facilitated by a rod which could be passed through the hollow spindle and screwed into a hole in block *C*.

The bending load was applied to the specimen through a bell-crack, *H;* a counter, *I*, indicated the number of cycles; and a micrometer screw, *J*, served as an adjustable electric contact to stop the machine at any desired change in deflection of the specimen caused by fatigue cracks.

It was found in preliminary tests that the rotation of the spindle caused the cooling liquid to be thrown out of the flask. Covering the flask and inserting baffles did not solve the problem. The only successful solution found was to surround the spindle with a tube, *K* (Fig. 1). Openings were provided in the bottom of this tube and around a ring near the top. In operation the cooling liquid flowed up the tube and was discharged out the holes at the top. A deflector ring near the top of the tube, *K*, caused the liquid to be deflected down into the flask. A slinger-ring, *L*, attached to the spindle inside tube, *K*, served to prevent the liquid from escaping around the spindle.

Another problem in the operation of this machine at low temperatures was lubrication of the lower bearing, *D*. The lubricant used was the cooling liquid itself. For operation in liquid air or liquid nitrogen a hazard was present because of the volatility of these liquids operating at their boiling point. Since heat was dissipated in the bearing during operation, rapid vaporization of the liquid resulted so that provision was made for escape of the vapors. This was accomplished by leaving the bottom of the bearing housing open but covering it with a fine screen to filter out the water-ice particles which might damage the bearing.

It was found that locating the specimen at a distance from the bearings as in this machine was an advantage even for tests at room temperature, especially for plastics. In other types of rotating-beam fatigue machines the heat developed in the bearings causes an increase in specimen temperature that may affect the results. A comparison of the results obtained with this machine and another rotating cantilever-beam fatigue machine has been reported in another paper (3).

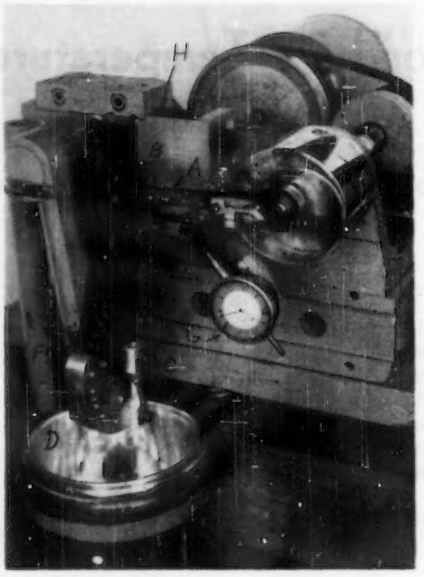


Fig. 3.—Repeated-Bending Fatigue Machine for Low-Temperature Tests.

An electric furnace has also been designed to permit operation of this machine at temperatures up to about 600 F.

Repeated-Bending Fatigue Machine for Low-Temperature Tests

A cantilever-beam-type fatigue machine capable of testing fatigue specimens in flexural, torsional, or combinations of flexural and torsional states of stress over varying ranges of stress and at low temperatures, is shown in Fig. 3. The machine is a modification of apparatus designed for combined bending and torsion fatigue described in another paper (4). The connecting rod, *A*, and the connecting link, *B*, which were vertical and horizontal, respectively, in the original machine, have been rotated through 90 deg to enable the specimen *C*, to be immersed in a vacuum flask, *D*, containing a refrigerant such as liquid nitrogen. The specimen was attached to a plate, *E*, which in turn was attached to a dynamometer spring, *F*, whose dial, *G*, indicated the moment applied to the specimen. The upper end of the dynamometer support was attached to a sliding block, *H*, which could be moved horizontally to provide any desired mean stress in the specimen. The entire fixture to which the specimen was attached was immersed in the refrigerant.

The total consumption of the refrigerant (liquid air or liquid nitrogen) was minimized by increasing the speed of the machine and by making the parts which projected out of the refrigerant of minimum cross-sectional area and of material having low heat conductivity. The connecting link, *B*, was also made as light as possible to reduce dynamic effects. Tests made with liquid air indicated a consumption rate of about 0.5 liters per hour. About 5 liters were required to cool the parts to the equilibrium temperature.

Calibration of the machine involved a static calibration of the dynamometer both at room temperature and at the operating temperature together with a dynamic calibration of the machine at both temperatures. For the dynamic calibration, an SR-4 strain gage was fastened to the specimen (at about $\frac{1}{4}$ in. away from the minimum section in order to reduce breakage of the gage) and an a-c bridge circuit was employed to indicate the maximum strain for a given amplitude both when the drive shaft was rotated slowly by hand and when rotated at testing speed. The apparatus and technique devised for these strain measurements were described earlier by Worley (5).

A negligible difference was found between the calibrations at room temperature and those at liquid-air temperature, but the calibrations showed dynamic strain amplitudes as much as 5 per cent above the corresponding "static" amplitude, depending on the speed of operation. Experimental data showed that as the speed increased from zero to 3000 rpm, the ratio of dynamic to static strain of the specimen increased from unity to 1.05. Further increase in speed from 3000 rpm to about 5500 rpm resulted in a decrease in the ratio from 1.05 to about 0.80; the value of the ratio was unity at about 4000 rpm. No experimental data were taken for speeds higher than 5500 rpm.

A theoretical analysis (6) indicated that as the speed increased from zero to 5700 rpm the ratio of dynamic to static strain of the specimen decreased continuously from unity to 0.20. The analysis also indicated that a further increase in speed would result in an increase in the ratio of dynamic to static strain and that a speed of 6200 rpm was a critical (resonant) speed at which the ratio would become infinitely large. These results may seem somewhat unusual; however, it must be remembered that the complex mechanism involved is not equivalent to a simple spring-mass system. Lack of agreement between theoretical and experimental results is attributed to certain simplifying assumptions made in the theoretical analysis (6) and to experimental error.

The ratio of dynamic to static deflection of the dynamometer was also measured experimentally and determined from theory. It was found from both theory and experiment that this ratio increased continuously from unity at zero speed to about 3 at 5000 rpm.

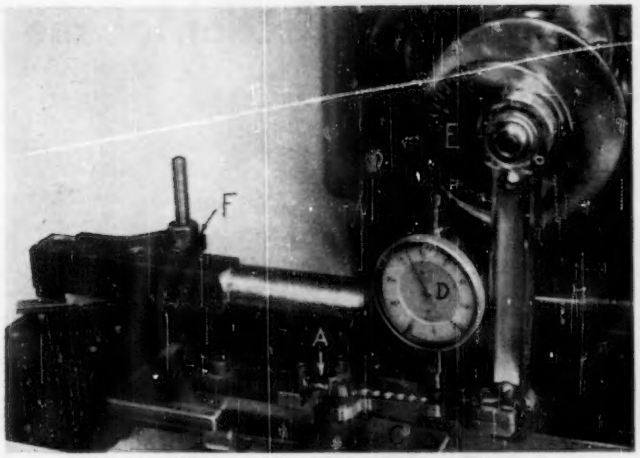


Fig. 4.—Miniature Specimen Fatigue Machine.

The theory indicated a further increase should be expected as the speed approached the resonant speed of 6200 rpm. Agreement between theory and experiment was closer for the dynamometer than for the specimen.

Miniature Specimen Fatigue Machine

The apparatus shown in Fig. 4 was designed for testing miniature specimens in fatigue since small specimens were necessary in determining the fatigue strength of specimens cut perpendicular to the direction of rolling of $\frac{7}{8}$ in. diameter bars. This information was needed in determining the isotropy of the material tested in studies (7) of fatigue under combined bending and torsion.

The apparatus consisted of a Krouse plate-bending fatigue machine modified as follows: one end of the specimen, *A* (Fig. 4) was clamped to the fixed plate, *B*, and the other end was clamped to the lever arm, *C*. These arrangements for loading the specimen in bending or torsion are shown schematically in Fig. 5. Figure 5(*a*) shows the specimen clamped to the plate, *B*, and to the lever arm, *C*, in the position for bending and Fig. 5(*b*) shows the specimen in the position for torsion. Dimensions of the specimens used for bending or torsion fatigue tests are shown in Fig. 5(*c*). A dial, *D* (Fig. 4) was attached in such a way as to indicate the deflection of the specimen and was arranged so that the plunger could be raised during testing.

The procedure used in these tests was essentially the same as that described in another paper (7) except for differences caused by the smallness of the specimen. Because of the size of the specimens, it was necessary to exercise extreme care in their machining and also in mounting the specimens in the machine in order not to prestress the specimens higher than the stress to which they were to be subjected in the test. For example, special techniques had to be employed to avoid overstressing the specimen while tightening the screws. Also a removable counterbalance had to be attached to the lever arm, *C*, to balance its weight while the position of zero deflection was being determined.

The deflection corresponding to the desired stress in the specimen was obtained by using the specimen together with the dial, *D* (Fig. 4) as a dynamometer and calibrating it by weights. To avoid overstressing the specimen during the calibration, deflections were kept below that needed to produce the desired stress and an extrapolation method was used to determine the necessary deflection for that test. The desired maximum and minimum deflections were then provided by means of the adjustable throw crank, *E*, and sliding grip-holder, *F*.

Specimens tested in torsion frequently fractured in such a manner that the two pieces interlocked so that the machine might run indefinitely without shutting off. Because of this fact, it was found necessary to inspect the specimen frequently to determine when fracture had occurred.

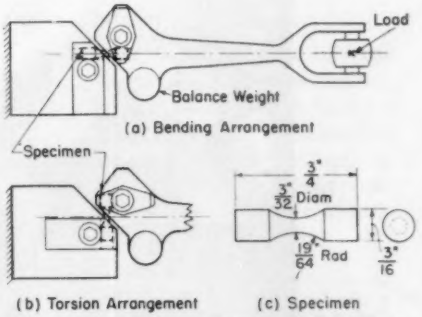


Fig. 5.—Fixture and Specimen for Miniature Fatigue Testing.

Acknowledgments:

The development of this equipment was a part of the work of the Engineering Experiment Station of the University of Illinois, W. L. Everitt, Director; in the Department of Theoretical and Applied Mechanics, F. B. Seely, Head. The financial assistance of the Plastics Division of Monsanto Chemical Co. in connection with the vertical-spindle fatigue machine is appreciated.

The assistance of D. Bailey, R. E. Duff, and R. A. Wright in the design and construction of the apparatus is gratefully acknowledged.

References

(1) W. N. Findley, "Fatigue Tests of a Laminated Mitscherlich Paper Plastic," *Proceedings*, Am. Soc. Testing Mats., Vol. 45, p. 878 (1945).

(2) W. N. Findley and W. J. Worley, "Mechanical Properties of Five Laminated Plastics," *Technical Note 1560* NACA, August, 1948.

(3) W. N. Findley and W. J. Worley, "The Elevated Temperature Creep and Fatigue Properties of a Polyester Glass Fabric Laminate," *Journal*, Soc. Plastics Engrs., Vol. 7, No. 4, pp. 9–11 and 17 (1951).

(4) W. N. Findley and W. I. Mitchell, "Two Machines for Combined Bendind and Torsion Fatigue," presented at meeting of Soc. for Experimental Stress Analysis, Indianapolis, Ind., May 14, 1952.

(5) W. J. Worley, "Simplified Dynamic Strain Equipment," *Instruments*, Vol. 21, No. 4, pp. 330–332 (1948).

(6) W. I. Mitchell, "The Design and Dynamic Calibration of a Low Temperature Constant Deflection Type Fatigue Testing Machine," M.S. Thesis, Department of Theoretical and Applied Mechanics, University of Illinois (1947).

(7) W. N. Findley, "Fatigue of 76S-T61 Aluminum Alloy Under Combined Bending and Torsion," *Preprint 97*, Am. Soc. Testing Mats., June, 1952.

Problems Accompanying the Introduction of the Newer Synthetic Fibers

By J. H. Dillon[1]

In accepting this kind invitation to address you, I decided to talk about "new problems unsolved" rather than "old problems conquered." I feel that it is high time that some of us view carefully the situation in our great textile industry and consider with pure objectivity, "Where do we go from here?" Perhaps, as a representative of one of the few research organizations in this country entirely devoted to the technical progress of the textile industry *as a whole* and supported by units from *all* its branches—manufacturers and suppliers—I can give you an objective picture. At least, I shall try to do so, ignoring past glories and looking along the road ahead.

The Textile Volcano

Let us look at the great changes taking place in the textile industry and those looming in the future. Let us view this textile volcano from afar, and with what little time we have, before it explodes into full eruption. Thus far, we have heard only its warning rumblings. Atomic scientists have not yet suggested the possibility of complete climate control nor a depression of the human urge for adornment. Hence, it seems quite appropriate to use the volcano analogy when our great textile industry is contemplating these major changes in its raw materials and processes.

It does seem, however, that a number of mountains are being made of molehills these days; secondary responses to the powerful technical, economic, and consumer pressures are building up to that critical value which may someday cause the textile volcano to "blow its top." Some of us feel that the eruption is already occurring and think we observe the gradual envelopment and obscuration of the molehills by the "lava of progress," yet data now at hand do not indicate that the eruption, sudden or gradual, will result in the disappearance of the principal natural fibers, cotton and wool, from the textiles scene. Rather it would seem more probable that the flow of lava will produce redistributions of their functions, perhaps *via* the path of fiber blending.

Certainly, the proponents of the natural fibers have an opportunity equal to that of the man-made fiber interests. In particular, cotton and wool are magnificant fibers which have never been reproduced in a laboratory. But they, like the man-made fibers, have weaknesses, and their methods of processing are far from perfect. Hence, they need not be destroyed by the lava of progress but can flow with it, if their proponents are willing to underwrite sound, long-range scientific and economic research and apply its findings to a much greater extent than they now seem inclined to do.

But suppose we now forget about the 80 per cent of our textile fiber consumption constituted by the natural fibers, cotton and wool, admitting their fine attributes along with their weaknesses but assuming that the latter will largely be corrected through research. In discussing the other 20 per cent made up by the regenerated and synthetic fibers, it will be necessary to refer to the natural fibers from time to time for they are convenient reference materials, hazily understood it is true, but reference materials with which the textile industry has had centuries of experience.

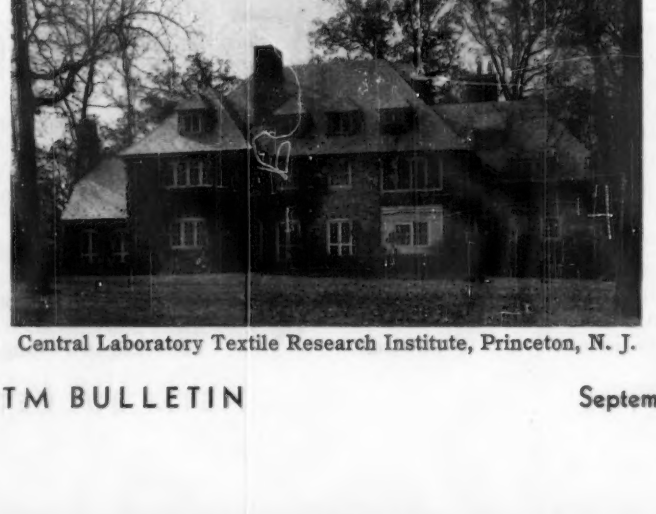
Creation of a Man-made Fiber

The basic concept of the man-made fiber is not very new. Some 3000 years ago the Chinese devised a process of drawing fibers by means of a needle from the collected secretions of silkworms. This was essentially the same process described in the first British patent on nitrocellulose rayon production, granted to Audemars in 1855. The cellulose nitrate solution which he specified was made from mulberry twigs. His process never proved practical and it seems that the first suggestion of the extrusion process used today was made by the physicist, Robert Hooke, in his "Micrographia" published in 1664.

I shall not go on with the history of man-made fibers; if you are interested in it, I recommend reference to a paper by Loasby.[2] I mention these early beginnings of it only to emphasize that the pressures contributing to the textile volcano have been building up over a very long period of time. The earliest pressures resulted from human curiosity, perhaps that of the virgin Chinese princess, Tu Yung Tu, and a little later, scientific speculation on the part of Hooke and Réaumur came into play. From that time on it was only a matter of scientific progress, development of industrial methods, and the addition of economic factors until regenerated and synthetic fibers became important contours in today's textile picture.

General Elements of Success for a Textile Fiber

There are three basic elements in the success of a textile fiber, natural or man-made. These elements are availability, price, and superior properties for each application, and they may be balanced in different proportions. For examples, a low quality fiber which is very cheap but available in great quantity may fill one important need. Likewise, a high quality fiber, priced rather high, may profitably fill another niche. It seems highly improbable that any one fiber will ever have the versatility to meet the requirements of every textile application, even though it is available in large quantities and is extremely cheap.



Central Laboratory Textile Research Institute, Princeton, N. J.

An address given before the Philadelphia District of ASTM, February, 5, 1952 at the Philadelphia Textile Institute.

[1] Director of Textile Research Institute, Princeton, N. J.

[2] G. Loasby, *Journal*, Textile Inst., Vol. 42, p. 411 (1951).

Measurement of tracer-labeled dye absorption in a single fiber with a proportional counter.

Measurement of yarn properties with the Instron testing machine.

But all three requirements, availability, price, and "specific quality", must be met in some degree by any fiber, if it is to have a long-range future.

In the light of these facts, I shall limit my discussion to those presently available man-made fibers which can be produced commercially for a reasonable price, mentioning the important natural fibers only as reference materials. You will understand also that I prefer to discuss the various regenerated and synthetic fibers wherever possible by classes rather than as individuals. Hence, let us consider the problems introduced by the principal man-made fibers, not by way of destructive criticism, but in an effort to envision future progress in their development.

Fiber and Yarn Problems

Among the problems introduced or intensified by the man-made fibers, are some which relate specifically to the fiber itself and its processing into yarn—uniformity, specific gravity, strength, extensibility, creep, resilience, moisture absorption, dyeability, chemical stability, surface characteristics, and crimpability.

Uniformity:

One of the basic tenets of the organic chemist is that perfect uniformity can be achieved in a synthetic product. This is theoretically true, but from the standpoint of the textile mill which is faced with using viscose rayon from several suppliers, each with his own process and finish, the principle sometimes vanishes as a practical, realizable fact. Furthermore, each supplier is apt to make changes in his product which influence its behavior in the mill processes; occasionally, changes in a given product occur accidentally which raise just as many difficulties in spinning and weaving. Furthermore, some of the natural fibers are more uniform in basic chemical structure and physical properties than was once supposed. For example, in connection with the international Wool Research Project[3] conducted by Textile Research Institute in cooperation with the Forstmann Woolen Co, it has been shown that wool of different grades and origins is a remarkably uniform material chemically and that differences in physical behavior largely result from measurable variations in average fiber diameter and crimp. Thus, while the man-made fibers are, in general, more uniform than the natural fibers in chemical constitution, diameter, and physical properties, there are still important exceptions which the fiber suppliers must strive to eliminate. No one would suggest that all rayon producers should attempt to provide exactly the same product or that each should freeze his product forever to give a constant set of properties. This would be contrary to the laws of progress and competition. However, efforts should be made to avoid accidental variations and define the processing and fabric quality consequences of intentional changes. The ASTM is playing an important rôle, of course, in the solution of this important problem.

Specific Gravity:

Specific gravity of a fiber is like the weather—it makes a lively subject for conversation but not much can be done about it. Ignoring for the moment the inorganic fibers, the range of specific gravities of the synthetics is not very great—1.14 for nylon to 1.5 for viscose rayon. Nevertheless, even a small difference in specific gravity may have a profound influence upon the distribution of two different staple fibers in a blended yarn. When a continuous filament synthetic is fed to the spinning frame to give a specialty "core yarn," differences in specific gravity may be crucial. Hence, the producer of man-made fibers must consider carefully the effects of producing either a low or high gravity fiber upon its spinning properties as well as its acceptance on a price per pound basis.

Strength:

The so-called "dry tenacity" (measured at 70 F and 65 per cent relative humidity) has perhaps been overemphasized in the development of the man-made fibers. All of the new synthetics, nylon, Dacron, Orlon, Dynel, Acrylan, etc., are extremely strong, both dry and wet, tenacities ranging from 3.0 to 7.0. This fact contributes to their acknowledged excellence in abrasion resistance, particularly when they are blended with relatively weak natural fibers such as wool (1.3 g per denier dry). In some cases, this aspiration to high tenacity has resulted in sacrifice of other desirable properties such as the high recoverable extensibility characteristic of wool and a reasonable degree of moisture absorption. The regenerated fibers, on the other hand, can still be improved by developing higher tenacities, particularly wet tenacities. Viscose rayon of textile grade, of course, is in a rather good position with a wet tenacity of about 1 g per denier which is equal to that of wool. The regenerated protein fibers, however, have some distance to go in wet tenacity before they equal wool. Even with a wet tenacity of only 0.6 g per denier, however, they are being spun successfully into blended yarns to which they

[3] Sponsored by the International Wool Secretariat, the American Wool Council, the National Wool Trade Assn, the U. S. Department of Agriculture, the Office of Naval Research, and by a number of American wool manufacturers.

impart an unusual "loft." With these few exceptions, then, achievement of high fiber tenacity by the man-made fibers is no longer a pressing problem. It would be interesting, of course, if fibers of still higher tenacities were developed since this may make possible the spinning of extremely fine yarns not contemplated today.

Extensibility:

The problem of matching the dry extensibility of wool has been handled reasonably well for the various synthetics and acetate rayon. For examples, nylon, Dacron, and Dynel have extensibilities at break over 25 per cent whereas the average dry extensibility of wool is about 35 per cent. Cotton, of course, is a very inextensible fiber—dry extensibility at break about 5 per cent—and only a few of the man-made fibers such as Fiberglas and Fortisan come within this range. It is doubtful, however, whether much more work will be done in this direction since it is now recognized that it is preferable to match the whole stress-strain curve of a natural fiber in order to reproduce its processing and product properties. Considerable success has already been achieved along these lines. Furthermore, a number of laboratories have reached the stage where they are not merely attempting to copy the stress-strain behavior of the natural fibers but rather have set up idealized stress-strain models based on knowledge of the demands of processing and fabric quality. Future developments will probably be based on this approach which demands further intensive studies of processing and fabric quality as functions of the mechanical properties of the individual fibers. Much of the work of Textile Research Institute is of this nature.

Creep:

Creep is simply deformation which is irrecoverable or only slowly recoverable. It was one of the serious weaknesses of the early man-made fibers, particularly of the first viscose rayons used for tire cord. Creep is recognized today as a serious weakness to be avoided in a new fiber. Because many of the hydrophobic fibers are essentially thermoplastics, creep still remains a problem, particularly as it manifests itself in the temperature ranges of ironing. It must be remembered, however, that the natural fibers also possess creep, especially under conditions of high moisture content. Thus, creep is still a problem but a certain amount of it can be tolerated in a man-made fiber. This is fortunate for there is little possibility of its complete elimination in fibers formed of organic materials.

Measuring fiber diameter by the method of resonance vibration.

Resilience:

Resilience is that characteristic of a material which denotes elasticity or recoverable deformability. It is a very complex property which depends strongly upon the conditions of service. For example, a high tenacity rayon might be considered a very resilient material for tire cord applications since it would creep very little under continued inflation stresses and would generate relatively little heat in repeated cycling. For textile clothing applications, however, it would not compare with wool in resilience, for wool may be extended elastically to a much higher elongation. Conversely, wool would be very unresilient in a tire cord since, because of the large area of its hysteresis loop, serious heat generation would result.

None of the man-made fibers has yet approached the remarkable long-range resilience of wool in the dry state. However, several of them are much superior to wool in the wet state. Dacron is an excellent example and owes its striking crease-resistant clothing properties to its high wet resilience and its lack of felting shrinkage. It should not be inferred, however, that the goal of adequate resilience has been reached in the newer fibers; it is still a problem with many of them and a great deal of work is being done in this direction. The over-all resilience of a fabric is generally termed crease resistance and will be discussed later in that connection.

Moisture Absorption:

While the principal natural, regenerated, and derivative fibers all have reasonable moisture absorption—regains at 70 F, 65 per cent relative humidity—ranging from 6 per cent for cellulose acetate to 16 per cent for wool, the current fashion in the newer synthetic fibers is toward very low regain—0.4 per cent for Dynel, for example. There are inherent advantages in low moisture absorption such as quick drying after laundering. On the other hand, associated with low moisture absorption are difficulty in dyeing and excessive static electricity—important problems which I shall discuss later. Still more serious perhaps is the problem of human comfort which may or may not be solved to give satisfactory undergarments made of the hydrophobic fibers. The whole problem of the comfort qualities of clothing is extremely complex and, in spite of some recent brilliant work on it, requires extended study before the manufacturers of synthetic fibers will know whether moisture absorption is a necessity in undergarments, shirts, and socks. These studies must include an evaluation of the true comfort value of the heat of absorption which is claimed by some as a virtue of the hydrophilic natural fibers, cotton and wool. Until these difficult basic experiments are completed, it is impossible to say whether hydrophobicity is or is not a limited blessing.

Dyeability:

To develop even a cursory tabulation and analysis of the many different problems of dyeing would take more time than I have for this whole talk. Certainly many dyeing problems remain un-

Preparation of radioactive tracer-labeled dyestuffs in the "Hot Lab."

solved after years of work on cotton, wool, and viscose rayon. In general, we have found out how to get the dye molecule into their structures but frequently we have difficulty making it stay there. A common example is ribbed cotton socks which, even though carefully laundered, eventually crock preferentially along the ribs. I wonder whether anyone has worked on this problem with due recognition of the differences in stress systems in the ribs as compared to the areas between ribs. Perhaps this slant is entirely wrong but something should be done about this "pattern crocking".

The number of dyeing problems has been multiplied many times with the introduction of the hydrophobic synthetic fibers, particularly the acrylics. Here the normal swelling is so small that it is difficult to introduce the large dye molecule into the structure. In some cases, acetate dyes work pretty well, of course, and a number of clever chemical tricks for introducing the dye molecule have already been devised. Certainly great strides will be made by the able chemists of the fiber-producing organizations in solving these dyeing problems; otherwise, the hydrophobic fibers will never find wide acceptance. Another reason for optimism is that there is also quite a lot of fundamental research on dyeing going on. I rather expect, for example, that the work of Dr. White and his group at TRI, who are employing radioactive tracer techniques to study dyeing phenomena, will yield valuable basic data of eventual practical importance.

Union dyeing has always been a tough problem in the textile industry but its difficulty and complexity have been enormously increased by the introduction of the hydrophobic synthetic fibers with natural fibers into blended yarns. However, it seems safe to assume that this problem will be solved almost as fast as the problem of dyeing the individual synthetic fibers. It is quite possible, of course, that this may require multiple dyeings and new techniques such as those employing high pressures and temperatures.

Chemical Stability:

Chemical stability of textiles is a broad subject indeed, for it involves not only simple chemical reactions with liquids and gases but also those catalyzed by light. Some of the synthetics, Saran for example, have remarkable resistance to solvents. Others are acid- and alkali-resistant to a high degree. Some go to pieces rather badly in outdoor weathering while others, notably Orlon, are exceptionally good in this respect. Obviously, the synthetics can be designed specifically to withstand various chemical environments, but perhaps no one fiber will be good under all conditions. After all, why should it, particularly if this means sacrifice of other properties important to textiles?

Surface Characteristics:

If the early developers of man-made fibers had realized the profound influence of the peculiar surface structure of the wool fiber upon spinning, fulling, and dyeing and had they insisted on copying that fiber in all its characteristics, it seems safe to say that they would have given up the quest for a "wooly fiber" long ago. Indeed, a methodical scientific approach in this instance might have delayed the development of the wool-synthetic blends indefinitely. Fortunately for them and their employers, they by-passed this difficult problem and came out with smooth-surface fibers which still do remarkably well in fabrics where once wool was thought uniquely suitable. No synthetic fiber has been produced, it is true, that will full like wool. But now some attention is being paid to surface structure and it seems that great progress may be made from now on in this field. One result of producing a fiber with a rough surface has been a reduction in fabric pilling. Roughness of surface plus non-circular cross-section appears to give an interesting wooly feel in a fabric. Surface structure, then, seems to be a field justifiably neglected in the past but of great significance in the future of man-made fibers.

Crimpability:

It is very difficult for any fiber to be a good staple fiber unless it has some sort of crimp. This crimp may not necessarily be the pronounced regular type found in a fine merino wool; it may be the highly erratic type found in the cotton fiber. Most of the modern man-made staple fibers are crimped, in recognition of this principle. However, little is known about the exact type of crimp which is most effective in giving a yarn of the desired properties. This is a field of study which Textile Research Institute considers one of its major assignments, and we feel that a proper understanding of the role of crimp in processing and fabric quality can lead to major advances, both in the natural and man-made fiber areas. For example, a synthetic fiber with rather mediocre fabric properties in the uncrimped form can be crimped to give a quite satisfactory staple fiber. The crimp imparted must be reasonably stable, of course, and the process of crimping must be so designed that a minimum reduction of tenacity results. Here again is a field where considerable physical and chemical research remains to be done but which will certainly pay off in increased versatility of the man-made fibers.

Fabric Problems

In listing the fabric problems introduced or intensified by the introduction of the man-made fibers, it is necessary to be somewhat arbitrary for many of the fabric properties can be related quite directly to one or more of the fiber properties. Hence, the following problems are those which are manifested most commonly in fabrics and they include mechanical stability, soiling, ironing range, local melting, flammability, pilling, static electrification, wicking, felting, abrasion, crease resistance, and tactile qualities.

Mechanical Stability:

The human being lives in a chemical environment which is essentially nitrogen, oxygen, and water vapor. In cities there are also measurable outdoor concentrations of CO and CO_2, and indoors all sorts of gases and vapors may be present. But air in varying degrees of moisture content is all that need be considered in the majority of cases. The physical environment involves the temperature of the body, and this is a function of conduction, transmission, radiation, and evaporative processes of heat transfer. The problem of stabilization of the older fibers—wool, cotton, and viscose rayon—against moisture did not involve temperature to any great extent. For some of the newer fibers, the effects of moisture changes are trivial but the temperature factor has become increasingly bothersome.

There is one principle which serves as a guide in the thermal setting of the fabrics made of the hydrophobic synthetics—the necessity of exceeding the so-called "second-order transition temperature" in producing a permanent

configuration. Employing this principle, fabrics of Dacron, for example, can be pressed and creased permanently, providing that the "second-order transition temperature" is not thereafter exceeded. Another important principle applying to the hydrophobic synthetics and, in fact, to all the thermoplastic fibers is that their state of orientation is really a metastable state. Thus, when the temperature is raised, there is a tendency for the orientation to be relieved. Sometimes it is desirable to relieve part of the orientation, and this can be done without major reduction in yarn tenacity. However, if one goes too far in this direction, serious impairment of yarn and fabric qualities results.

Soiling:

One of the major advantages claimed for the smooth-surface hydrophobic synthetic fibers is the ease with which soil can be removed. This is true in general, but there do arise situations with certain types of soil where the smoothness of the fiber actually encourages soil retention and difficulty of removal. An extreme example is the retention of graphite by nylon in the lace process. In other situations, fabrics employing man-made fibers are found to soil quite rapidly, probably because of the electrostatic effects, but the soil can be removed simply by wiping with a water-wet cloth. It has also proved difficult to produce carpets of the man-made fibers which have the remarkable resistance to soil possessed by wool carpets. Thus, it is evident that soil retention is still a problem with the newer fibers although many of them are much superior in this respect to the natural fibers and particularly to the older man-made fibers such as viscose rayon.

Ironing Range:

It is well known that some of the man-made fibers, such as cellulose acetate and Dynel, have rather low softening points and must be ironed at relatively low temperatures. Although some of the hydrophobic synthetics are quite satisfactory in this regard, it is interesting to find that the effective ironing temperature depends rather strongly on fabric construction and can be increased substantially by blending the offending synthetic with another material of high softening-point. Hence, no fiber should be discarded solely on the basis of a moderately low softening point.

Local Melting:

Yet another problem introduced by the synthetics is their property of melting to form a small hole in a garment upon which a spark falls from a pipe or cigarette. Even Dynel, which does not burn at all, melts under this condition. Obviously, some reduction of this difficulty can be achieved by developing fiber materials with higher melting temperatures, but there is undoubtedly a limit beyond which it would not be practicable to go.

Flammability:

The flammability of certain types of fabrics has become a very hot subject. It was certainly unfortunate that the "brushed rayon" sweater came into vogue and was sold to the public. It is ill-considered acts of this type which create public suspicion of a fiber, or even of a whole class of fibers. I am sure that you all realize that the excessive flammability of these sweaters was due to the nature of the fabric—the brushed rayon effect produced optimum flammability in that the individual fibers were exposed to the oxygen in the air in such a manner that rapid burning took place.

Viscose rayon, of course, is a relatively flammable material but, when used in the proper applications, can hardly be considered dangerous except in extreme situations. Furthermore, some very promising results have been obtained with flameproofing treatments both for cotton and rayon, and the extent of the activity in this field suggests that the rayon manufacturers are fully aware of this basic deficiency of their fiber.

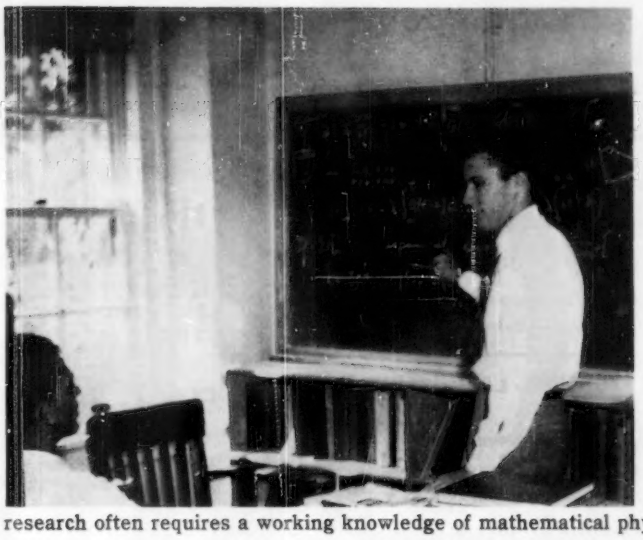
Wool, of course, is relatively good from the standpoint of flammability although statements that it does not burn at all are untrue. Some of the hydrophobic synthetic fibers, notably Dynel, do not burn at all, but a number of them melt and then burn in a very unpleasant manner. This can result in extremely painful burns on the skin when the flaming melted material makes contact with it. Flammability is indeed a field which deserves major effort on the part of the man-made fiber industry, but it must be remembered that we have lived with the flammable fibers, cotton and viscose rayon, for quite some time and shall probably be able to get along with the melting and flaming tendencies of some of the synthetics for a number of years until the flammability problem is solved.

Pilling:

Pilling is another difficulty which has been intensified with the introduction of the synthetics. It is not really a new problem, for pilling takes place to some extent with wool, viscose rayon, and acetate, but because those fibers are so much weaker than nylon, Dynel, and Dacron, the protruding fibers break off before the balling up or pilling develops to a serious stage. Pilling also takes place with cotton, particularly cotton gauze, so that it is not necessarily true that thermoplasticity or a high degree of creep is the dominating factor in pilling. At any rate, pilling with the high tenacity fibers is an exceedingly tough problem, and it shows up even in 50-50 blends with wool, not to mention 100 per cent synthetic fiber blankets and socks. Apparently some of the strong hydrophobic fibers pill much less than others, possibly because they possess unique surface characteristics which depress the migration tendency. Obviously, less pilling will be observed with a heavier denier fiber or with a longer staple, but this is not comforting when a fine staple fiber is desired for other good reasons. Undoubtedly, a considerable amount of work is being done on the nasty pilling problem both from the standpoint of individual fiber properties and the effects of yarn and fabric construction. It would seem, however, that the first task is to break the complex pilling effect down into the several contributing simple effects which must exist. Once the true nature of pilling is known, perhaps something can be done about it; at the moment it is one of the most bothersome problems faced in some of the newer fibers.

Static Electrification:

Static electricity is not exactly a new problem in textile processing and, under very dry conditions, static electricity has been known as a product problem also. However, the hydrophobic synthetics are intrinsically better dielectric materials than the old fibers and, because of their low moisture absorption, they generate reasonable large quantities of charge even at high humidities. From the product angle, this static generation is quite serious since it results in unsightly dust collection on dark-color fabrics under conditions of wear and in lint collection during laundry drying. There is also the clinging effect of women's dresses which results from static generation. Already considerable progress has been made in developing anti-static finishes, and some are supposed to be stable to laundering and dry cleaning. But the age-old problem of "triboelectricity" is one which has never been completely elucidated. It is known that there are factors other than high resistivity which influence frictional charge generation—one of them a property analogous to the contact difference of potential of conductors. Thus, there is room for some good, sound physical-chemical research on the basic nature of triboelectric effects in the hydrophobic fiber materials in relation to their molecular struc-



Fiber research often requires a working knowledge of mathematical physics.

tures. One of our TRI Research Fellows is working very hard on this difficult but interesting problem under a Participating Fellowship grant of Carbide and Carbon Chemicals Corp.

Wicking:

Wicking is another characteristic of the hydrophobic synthetics. This peculiar phenomenon whereby water penetrates rapidly through a fabric although the base fiber of that fabric absorbs only minute amounts of water, deserves a great deal of attention. This is rather ironic when one considers the remarkable crease-resistance properties of Dacron, for example. As you know, a pair of Dacron trousers can be laundered with no loss of crease. However, if one wears those Dacron trousers in the rain, almost every impinging raindrop seems to wick right through to the skin, resulting in a most uncomfortable situation. Sure enough, there will be no loss of crease or shrinkage, as would occur with wool, but wool trousers in the rain feel relatively comfortable. Clean wool, it appears, is a pretty good water repellent. Obviously, the wicking effect is largely a function of surface wetting or "contact angle," but it is probable that yarn and fabric geometry are also factors. It must be noted, of course, that wicking may be a good property in regard to the comfort qualities of socks or underwear. At any rate, here is another new problem which deserves attack on the fundamental plane.

Felting:

The felting of wool is both a blessing and a curse. One of the basic processes of wool manufacture is fulling, which is simply controlled felting. In general, the man-made fibers do not felt readily and, therefore, are not susceptible to the the fulling process. Recently, however, some of the hydrophobic synthetics have been fulled successfully, which indicates that the man-made fibers industry recognizes the desirability of inducing this characteristic. From the viewpoint of felting shrinkage of garments, of course, the newer fibers possess distinct advantages over wool and can be used in blends with wool to reduce materially the felting shrinkage. It will be interesting to follow the course of development of feltability in the synthetic fabrics; possibly a better balance between its beneficial and harmful effects may someday be achieved.

Abrasion:

The abrasion resistance of the hydrophobic synthetic fibers is very high, particularly when compared with wool in similar constructions. Furthermore, the introduction of reasonable amounts of these fibers into wool hosiery yarns enormously increases the abrasion resistance and at the same time reduces felting shrinkage. Hence, abrasion resistance can hardly be considered a major problem of the newer synthetics, and it seems possible that we may find, in the future, abrasion resistance sacrificed in order to enhance other inversely related qualities.

Crease Resistance:

Untreated viscose rayon can hardly be considered a crease-resistant material. For that matter, neither is cotton. Nevertheless, it is now becoming evident that the newer crease-resistance treatments can produce major improvements in cotton and viscose rayon without the accompanying disadvantages of odor and fabric harshness. Most of the hydrophobic synthetic fabrics have good crease-resistance properties, Dacron being one of the outstanding ones, as noted earlier. The general field of improving crease resistance for all the fibers, natural and synthetic, is one which deserves wide attention and, judging from the quantity of work now going on, there will be further major accomplishments in this field.

Tactile Qualities:

Pleasantness of touch is a quality which varies greatly from fiber to fiber but also is a function of the yarn and fabric. Some of the man-made fibers have an unpleasant, clammy feel when used next to the skin while others give a quite pleasant contact sensation. The use of crimped staple largely reduces these unpleasant tactile qualities, but this solution, of course, is limited only to the loftier staple yarn fabrics. The effects of moisture absorption and heat of absorption also play a role in tactile qualities, so again we must wait for the previously discussed experiments on comfort qualities before a decision can be made as to the tactile future of some of the synthetics.

Conclusion

In presenting this cursory survey of the problems facing scientists of the fiber-producing industry, a number of important general assignments have been omitted. For example, the great field of developing new textile processes and machinery more suitable for the newer fibers has not been touched upon. I do hope that I have established the magnitude and variety of the research and development effort which must be expended to solve these problems. Solving this set of problems will undoubtedly create others. I believe, furthermore, it is clear that both fundamental and applied research will be necessary and that a good portion of it will go into improvements in the natural fibers which are far from obsolete. In fact, there is a growing conviction that one of the results of increased use of the man-made fibers will be the discovery of new uses for the natural fibers. Certainly, there will be increased effort to expand the utilization of the natural fibers through scientific research and marketing studies. As the textile volcano gradually reaches its final stage of eruption, the textile industry stands to profit greatly by the opportunity of having at its disposal an almost unlimited variety of raw materials with a concomitant stabilization of raw material price structure. The textile industry must realize its obligation to contribute to this metamorphosis by expanding its own applied research programs and supporting fundamental research at PTI, TRI, and other academic institutions; the greater this contribution, the greater will be its benefit from the volcanic changes which are only now beginning to take place.

PROFESSIONAL CARDS

On this page are announcements by leading organizations and individuals of their services.

BOWSER-MORNER TESTING LABORATORIES

Chemical—Metallurgical—Testing Engineers: Field and Laboratory Inspection and Tests—Chemical—Physical—Metallurgical — X-Ray — Diamond Coring — Environmental Testing.

135-143 Bruen St. P.O. Box 51, Dayton 1, Ohio

W. B. COLEMAN & CO.

Metallurgists-Chemists-Engineers

Spectrographic Analysis
Chemical and Physical Testing
Metallurgical Investigations
Boiler Water Conditioning
Consultation Service

9th & Rising Sun Ave., Philadelphia 40, Pa.

COAL ANALYSIS PREPARATION

POWER PLANT ENGINEERING

COMMERCIAL TESTING & ENGINEERING CO.

228 N. La Salle St. Chicago 1, Illinois

Charleston, W. Va. Toledo, O. Cleveland, O.
Terre Haute, Ind. Norfolk, Va.
Rochester, N. Y.

Member: American Council of Commercial Laboratories

SAM TOUR & CO., INC.

Mechanical, Chemical, Metallurgical Engineers — Consultants

Research & Development Laboratories

44 Trinity Place New York 6, N. Y.

The Haller Testing Laboratories, Inc.

801 Second Avenue, New York 17, N. Y.
Tel. MUrray Hill 4-5358

Testing and Inspection of Construction Materials

New York, N. Y. . Boston, Mass.
New Haven, Conn. . Plainfield, N. J.

THE JAMES H. HERRON COMPANY

Engineers, Chemists, Metallurgists
Consulting, Inspecting, Testing
Physical, Chemical, Metallographic & X-Ray Laboratories
1360–1364 West Third St., Cleveland, Ohio

PATZIG TESTING LABORATORIES

ENGINEERING INSPECTION
TESTS • ANALYSIS • RESEARCH
—OF—
EQUIPMENT • APPLIANCES
MATERIALS & PRODUCTS

Ingersoll Ave. & 23rd St. Des Moines, Iowa

Tests Performed Using

ROBINSON CUPOLA COMBUSTION CALCULATOR

Louis G. Robinson Laboratories
1108 Eastern Ave.
Cincinnati 1 Ohio

NATIONAL SPECTROGRAPHIC LABORATORIES, INC.

6300 Euclid Avenue Cleveland 3, Ohio

Specializing in Spectroscopy Qualitative and Quantitative Analysis

SHILSTONE TESTING LABORATORY, INC.

Chemists & Engineers

Spectrographic Analyses*

New Orleans, La. *Houston, Tex.

Inspection at all leading industrial centers

Oklahoma's Oldest Independent Testing Laboratory

PROFESSIONAL ENGINEERS and CHEMISTS

Member American Council of Commercial Laboratories

OTL OKLAHOMA TESTING LABORATORIES

1145 N.W. SECOND ST. P. O. BOX 3506 OKLAHOMA CITY 6, OKLA.

TEXTOR LABORATORIES, INC.

Analytical and Consulting Chemists
Referee Sampling and Analysis
Iron Ore and Coal Cargoes
Chemical Research and Development

Established 1893

1627 EAST 25th ST., CLEVELAND 14, OHIO

ST. JOHN X-RAY LABORATORY

CALIFON, NEW JERSEY

COBALT 60

Phone: Califon 49

ELECTRICAL TESTING LABORATORIES, INC.

Electrical, Mechanical, Photometric, Radiometric, Chemical Laboratory and Associated Services

Certification, Inspections at Factories, and Field Investigations

2 East End Avenue *at* 79th St. New York 21 N.Y.

SOUTHERN LABORATORIES, INC.

Engineers — Chemists

Sub Soil Investigations
Physical, Chemical, and Soil Laboratories
Research & Inspection
Complete Model Shop

701 St. Michael St. Mobile, Alabama
907 Scanlan Bldg. Houston, Texas

In the solution of testing and research problems the guidance of professional advice is often most helpful and desirable.

THE DETROIT TESTING LABORATORY, INC.

Established 1903

554 BAGLEY PHONE WO. 1-6520
DETROIT 26, MICH.

South Florida Test Service

Testing • Research • Engineers

Consultants and specialists in corrosion, weathering and sunlight testing.

4201 N. W. 7th Street, Miami 34, Fla. Established 1931

Member: American Council of Commercial Laboratories

A. W. WILLIAMS INSPECTION COMPANY

Timber and Timber Treatment Inspections
Also
Complete Chemical and Physical Testing Laboratories

EXECUTIVE OFFICE: Mobile, Alabama
BRANCH OFFICES: New York, N. Y., St. Louis, Mo.

ROBERT W. HUNT COMPANY ENGINEERS

Inspection, Tests, Consultation, Research

CHEMICAL, PHYSICAL, METALLURGICAL, CEMENT and CONCRETE LABORATORIES.

175 W. Jackson Blvd., CHICAGO, *And All Large Cities*

LUCIUS PITKIN, INC.

ESTABLISHED 1885

Metallurgical Chemists & Consultants

Analysis—Sampling—Assaying
Spectrography—Metallography
Corrosion Studies—Research

PITKIN BLDG. 47 FULTON ST., N. Y. 38, N. Y.

The Oldest Commercial Laboratory In America

BOOTH, GARRETT & BLAIR

Established 1836

Analytical and Consulting Chemists Samplers and Weighers

228 South Ninth Street Philadelphia 7, Pa.

PENNIMAN & BROWNE, INC.

Established 1896

CHEMISTS - ENGINEERS

Laboratory and Field Services
Inspection - Testing - Research

Member: American Council of Commercial Laboratories

341 ST. PAUL PLACE • BALTIMORE 2, MD.

STILLWELL & GLADDING, INC.

Inspection-Sampling-ANALYSIS of Chemicals, Drugs, Fats, Greases, Oils, Waxes, Fertilizers, Glycerine, DDT., B.H.C., Chlordane, etc., Pyrethrum, Rotenone Products, Soaps, Solvents, Tests, AOAC., ASTM., NF., USP., Tobacco. Est. 1868

130 Cedar Street, New York 6, N. Y.